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STUDENT REPORT

Title:
*B*lockBand: Musical exploration

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Interactive sound systems

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403

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Abstract:

This report investigates the integration of hands-on modular music blocks with an integrated interactive digital audio workstation (DAW).

The purpose was to enhance engagement and experimentation in musical exploration among middle school students.

Don Normann's design principle, as well as prior commercial products such as LEGO Mind-Storm, were used for inspiration and the direction of the design of the product. Using the iterative development model, the study encompasses, pilot tests, user engagement scale, usability testing, and a task-based evaluation method in combination with an additional usability test as a final test. Which is used to refine and polish the product. The precision tests were also conducted to see the rate that the blocks is registered and the variability of the values received.

The SUS score shows a mean of 68.3, which is an average score after filtering out the outliers; the mean user engagement score is 3.77 out of 5; and the reward factor is 3.95 out of 5. The post-season interviews was conducted and showed a general enjoyment the product, finding it intuitive and engaging. The interviews also shed light on how the participants would have experienced the product in a theoretical situation as the target group.

It's possible that through some minor changes, the product's usability score can improve by a large margin.

Through these tests, it showed an influence on the engagement in musical exploration in the group that was tested. Though the tests were not conducted on the intended target group it showed a positive trend and may be applicable to the intended target group.

GROUP: 403

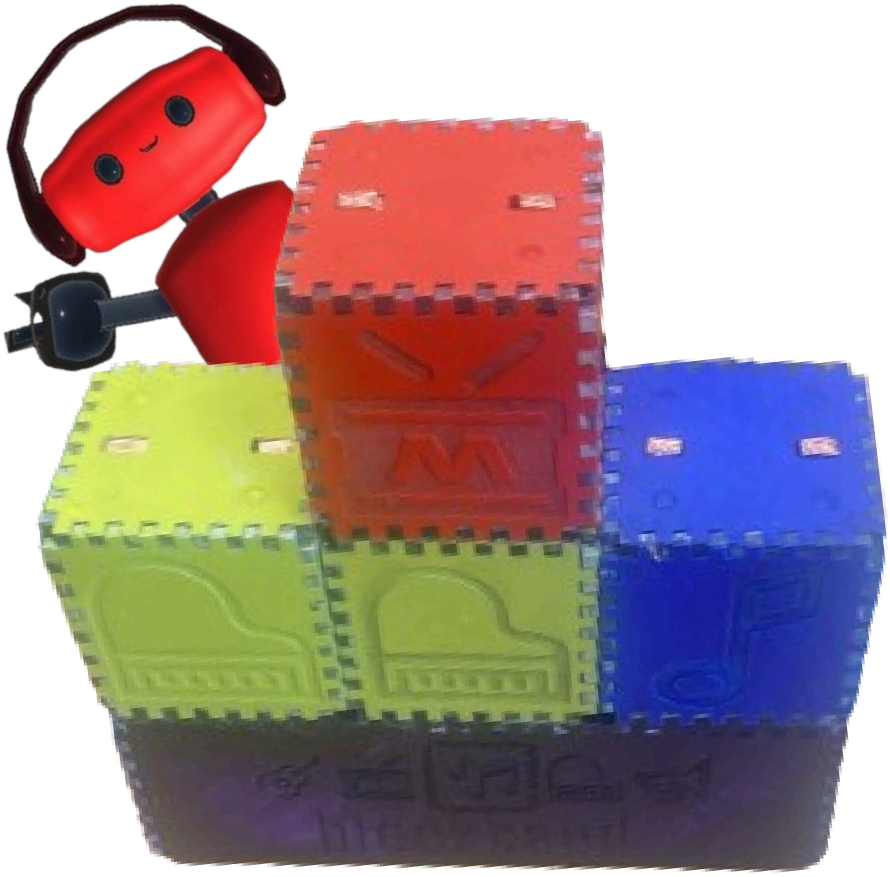
BLOCKBAND

Musical exploration

Bridging the Gap in Music Creation:
Enhancing Accessibility and Creativity through Digital Tools

4. Semester | Medialogy | AAU CPH

Halipha Ndikumana, Niels Christian Malte Felix Iuel, Simon Ingemann Axelsen, Malthe Kaare Hansen & Nathan Sean Littlefield



Contents

1 Introduction

From the start of human civilization, music has played an essential role, both to the individual and our cultural expression. Archaeological findings have demonstrated the enduring nature of music from there on, from bone flutes in the upper Paleolithic era [Hays n.d.], music keeps developing to Mozart, and further on to The Beatles and Metallica, to music being produced today. Musical instruments have developed over millennia in tandem with human inventiveness, providing an ever-growing range of tools for composing music. The development of music technology over time, from simple instruments to complex digital interfaces, is a reflection of our never-ending quest for artistic expression. Through this, music can be seen as a universal language.

As a universal language that cuts over boundaries of geography and culture, music has always been at the forefront of creative expression [Neuroscience 2024]. Music has many good effects; it can arouse feelings, create bonds, and even improve mental health [Psychiatry.org 2023]. For many prospective musicians, however, learning to play a particular instrumentthe traditional path to musical proficiencypresents a considerable obstacle, This is also supported by an interview with Danish Musician Association, that will explore the psychological well-being further (See appendix: A.3).

The enormous disconnect that exists between the basic human impulse to compose music and the technical know-how needed to realize it might deter people from realizing their full artistic potential [ScienceDaily 2018] [Miendlarzewska and Trost 2013].

Modern developments in digital musical instruments (DMI's) and interactive sound systems have started to close the gap between the desire to create music and the technical skills required to do so. These advancements democratize music making, making it accessible to people without formal education in music. Tools like digital audio workstations (DAW's), tangible user interfaces (TUI's), and innovative DMI's provide users with fun and intuitive ways to experiment and compose music. These technologies offer user-friendly interfaces, allowing individuals to focus on their creativity rather than technical proficiency.

Through the use of these contemporary tools, musicians can avoid the conventional learning curve and create music more freely and imaginatively, promoting an atmosphere that is more welcoming to all forms of artistic expression.

These new musical devices have enormous educational potential. Interactive music systems have the potential to promote social and emotional development, creativity, and cognitive growth [ABKA 2024]. People may now explore and produce music in ways that traditional music education frequently cannot, thanks to the introduction of digital instruments in educational settings.

In light of this, the goal of this study is to investigate how experimental music implementations might promote musical exploration. Through an analysis of the relationship between digital interfaces and music exploration, the goal is to comprehend how these resources might be best utilized to assist both inexperienced and seasoned users in their artistic pursuits.

The initial problem statement that directs this investigation is as follows:

1.1 Initial problem statement (IPS):

How can experimental music implementation be used to help explore musical ideas?

2 Analysis

This section of our project report delves into the specifics of our research approach and details: Don Norman's design principles, digital musical instruments, digital audio workstation, tangible interface, and physical manipulation. While also looking into existing products that fit the problem statement. Data were acquired via a series of interviews, which formed the basis of our analysis and earlier research done in the fields.

2.1 Verification of problem area

2.1.1 Musical education effects on intellectual abilities

Musical education can have a significant impact on brain function. The research in the article: "Music and the Brain" by Robert J. Zatorre [ZATORRE 2006] highlights different ways, musical training can affect the brain's structures and functions:

- **Brain Connectivity:** Through music education, it helps with the development of intricate networks within the brain. These networks are involved in more than processing musical sounds, so they can potentially enhance other cognitive functions due to their interconnected nature.
- **Brain Activation Patterns:** Music training modifies brain activation patterns, especially in regions related to motor control, visuospatial integration, and auditory processing. Advanced imaging methods such as EEG are used to examine these changes, which demonstrate how learning music causes the brain's activity patterns to reorganize, suggesting more effective processing of both musical and nonmusical stimuli.
- **The long-term Cognitive Benefits:** Research also points to the benefits of music education. It is possible that these modifications to brain structure and function will improve other domains of cognition, such as language, memory, and attention. However, the article also points out that further studies are required to completely comprehend these relationships.
- **Emotional and Social Benefits** Another point the article makes is that social skills and emotional intelligence can both be impacted by music education. Listening to and understanding music involves group effort and emotional interpretation, which can

improve empathy and collaborative abilities. These soft skills for social and personal development are essential.

[ZATORRE 2006]

Through this article, it can be seen that musical education looks to be beneficial for more than the understanding of music. This can be connected to the place where musical education is used frequently. The majority of musical education occurs in schools; in Denmark, music instruction is required for students in grades 1 through 6 [Børne- og undervisningministeriet 2024]. Thus, it is useful to investigate the effects that music education has on children's minds and the precise changes that music education makes to the brain.

The impact of musical education on children's intellectual capacities is examined in a systematic review by Jaschke et al. [Jaschke et al. 2013], which highlights the importance of employing rigorous procedures in research. The review finds a strong correlation between music education and gains in a range of cognitive abilities, such as math, reading, reading comprehension, and general intelligence in children between the ages of 4 and 13.

The results show that improving language-related skills such as phonological awareness and reading comprehension is one of the most notable advantages of music instruction. These gains give children a significant advantage in the classroom and are primarily attributable to the improved auditory processing abilities that come with musical training.

The paper also highlights a connection between mathematical prowess and musical expertise. Through improved pattern identification and problem-solving skills, which are essential to mathematical thinking, music education helps children better understand mathematical concepts.

Overall, Jaschke et al.'s systematic review suggests that these educational initiatives may be extremely important for children's cognitive and academic development. Which highlights an importance of musical education and creativity. [Jaschke et al. 2013]

2.2 Strøm til Børn

To further gain knowledge about the topic of educating children with digital instruments, contact was made with a Danish organization called *Strøm til Børn*. Strøm til Børn is an organization dedicated to advancing "technological education in musical creativity for everyone,"

as stated on their website[Strøm Til Børn 2024]. Their work focuses on introducing digital instruments to children in the hopes of boosting creativity and curiosity. Their work involves going to primary schools with digital instruments and making the children work in creative environments with the instruments, so they can create some meaningful experiences for the children and give them some inspiration for the future. "*But our main focus is definitely to give children an experience with success stories with creating their own music*" (See Appendix: A.4)

A semi-structured interview with Jeanette Frederiksen, the project manager for Strøm til Børn, was conducted to gain further insight on the motivation and goals behind their organization. The interview transcription can be found in the appendix (See Appendix:A.4). In the interview, Jeanette talks about the motivation for the project, their target group, and why they have chosen the choices they have.

In the interview, Frederiksen says after being asked what the goal is for Strøm til Børn "*Our goal is to give them some experiences of success with them creating their own but also to give them a feeling that they can create. It makes them want to and gives them inspiration to create something regarding sound, create their own music, and give them a sense of mastery.(See Appendix: A.4)* ".

Frederiksen mentions that their group of children varies between the 4th and 6th grade, with *And we are focusing on 4th to 6th grade* (See Appendix: A.4) and further explains the issues regarding this specific group in schools. "*Maybe around 95 percent of those children have not tried creating music before.*" (See appendix: A.4), and "*There is music understanding and music exercises, and then there is music creation. And then still, there are so few children that have tried making music, and it is not because the music teachers do not want to, but because they do not have the resources or competencies to do it.*" (See appendix: A.4). Frederiksen underlines an issue with the lack of creative exploration children have in schools because of a lack of resources, which is an issue regarding the growth of children's creative freedom. Therefore, it can be argued that children in the 4th to 6th grade is a great target group, as a clear problem is apparent in their lives regarding musical creativity.

Furthermore, the reason for schoolchildren being chosen, is because in a school all types of children with different economic backgrounds can be found, therefore broadening the target group's diversity without changing the parameters of the group. Frederiksen mentions this

in the quote: "*I have been a music teacher for many years, also in music schools, and there is only one type there. If you can say it like this: there are only resource-strong families where they have the money to pay for the education at Jeanette's once a week, then it's a closed club, you could say, the music schools. But in primary schools, everyone is sitting, and that is what's so cool about this project.*" (See Appendix: A.4), with also another quote "*So the primary school is cause of the sense of democracy we meet in all the children*".(See Appendix:A.4) Frederiksen further underlines why it's specific middle school children that are chosen with "Why 4th to 6th grade? We chose it because it has been the last two years in primary school where they have music as a mandatory subject." (See appendix:A.4). The full interview can be found in Appendix (A.4)

It should be noted that the appendix is a transcription that has been edited by Jeanette herself after the interview was conducted. Jeanette was sent the transcription, which she herself edited and corrected. The validity of the interview can therefore be interpreted as high.

2.3 Target Group

Based on the interview from Strøm til Børn, the target group can be chosen to be middle school children, as a clear problem was shown in this specific group through interviews. There is also academic research on the benefits of music education for children's intellectual abilities that underlines why it is important; therefore, middle school children would be an optimal choice.

Strøm til Børn is an endeavor aimed at acquainting children with electronic music, highlighting the need to focus on this specific age range. The work of this organization shows how middle school children can understand intricate musical ideas, provided they are given in an interesting and approachable way. Their ability to make electronic music composition understandable and entertaining for children supports the project's selection of this target audience even more.

The article "Music Education and Its Effect on Intellectual Abilities in children: a systematic review" provides a thorough analysis of the ways in which music education affects children's cognitive abilities between the ages of four and thirteen. Through this, it can be shown that benefits would also be certain if some sort of music implementation would be applied to

children.[Jaschke et al. 2013]

In summary, the choice to focus on middle school children for the development of a musical product is not arbitrary, but rather is informed by substantial evidence and expert opinion. This age group represents a prime demographic for the introduction of musical concepts through interactive means, promising not only to enhance their musical skills, but also to contribute significantly to their overall intellectual and emotional development. Using insights from both practical experiences and academic research. Therefore, the target group has been chosen to be middle-school children.

2.3.1 Designing for children

The interview with Jeanette Frederiksen from 'Strøm til Børn' made one thing very clear; that there are key distinctions between designing for children and to design for adults.

Adults value their interface to be educative, while children value that the interface is fun. There are numerous valuables to consider when designing for children. Not only should the interface be easy to use, it should not be a safety hazard. And if you ask a parent or a teacher, they would probably want the interface to contribute to the children' cognitive and/or physical attributes.[Cantuni 2020]

Researchers, in association with Nielsen Norman Group, conducted three rounds of usability studies, testing a total of 125 children on website designs. [Sherwin and Nielsen 2019] The study facilitated the creation of a table that summarizes the examined user behavior between children and adults.

		Children	Adults
Same	Following UI conventions	Preferred	Preferred
	User control	Preferred	Preferred
	First reactions	Quick to judge site (and to leave if no good)	Quick to judge site (and to leave if no good)

(a) Table summarizes observed UX that are shared between children and adults [Data source: Sherwin and Nielsen 2019]

Small difference	Willingness to wait	Want instant gratification	Limited patience
	Multiple/redundant navigation	Very confusing	Slightly confusing
	Back-button	Used in apps and websites when prominent, but browser back button not used *(young children)* Relied on *(older children)*	Relied on
	Reading	Not at all *(youngest children)* Tentative *(young children)* Scanning *(older children)*	Scanning
	Readability level	Each user's grade level	8th to 10th grade text for broad consumer audiences
	Font size	14 point (young children) 12 point (older children)	12 point (up to 14 point for seniors)
	Scrolling	Avoid (young children) Some (older children)	Some
	Standard gestures on touchscreens (tap, swipe, drag)	Large, simple actions (young kids) Easy and well-liked (older kids)	Easy and well-liked
	Search	Bigger reliance on bookmarks than search, but older children do search	Main entry point to the Web

(b) Table summarizes observed UX between children and adults with a small difference [Data source: Sherwin and Nielsen 2019]

Big difference	Goal in visiting websites	Entertainment	Getting things done Communication/community
	Exploratory behavior	Like to try many options Mine-sweeping the screen	Stick to main path
	Real-life metaphors e.g., spatial navigation	Very helpful for pre-readers	Often distracting or too clunky for online UI
	Physical limitations	Slow typists Poor mouse control	None (unless they have disabilities)
	Animation and sound	Liked	Usually disliked
	Advertising and promotions	Can't distinguish from real content	Ads avoided (banner blindness); promos viewed skeptically
	Disclosing private info	Usually aware of issues: hesitant to enter info	Usually aware of issues: hesitant to enter info
	Age-targeted design	Crucial, with very fine-grained distinctions between age groups	Unimportant for most sites (except to accommodate seniors)

(c) Table summarizes observed UX between children and adults, with a big difference [Data source: Sherwin and Nielsen 2019]

When designing for children, it is important to remember that children are not dumber than adults; they simply require different usability guidelines. As the tables also show, children have a habit of being more exploratory. Even within the 312 year age group, there are major differences between the cognitive abilities and motor skills of a 3-year-old and a 9-year-old. Children aged 912 have well-developed physical abilities, and they can handle a greater cognitive load compared to those still in their proportional stage. In the design, it is crucial to have a clear goal for the activity and to communicate it in a language that the children can understand. And when showing while not telling, it is important that what is shown leverages existing mental models. [Cantuni 2020]

2.3.2 Personas

Personas were created for the target group, to be used as a tool for the design, so the focus on the design is in the right place. The goal was to make them as real as possible and use them as a tool for the design to use as a reference or guideline to help the subject stay on course.

Both personas are created from the information gathered from the analysis, the interview at Strøm til Børn, collaborative learning, and the musical education effect by Zatorre.

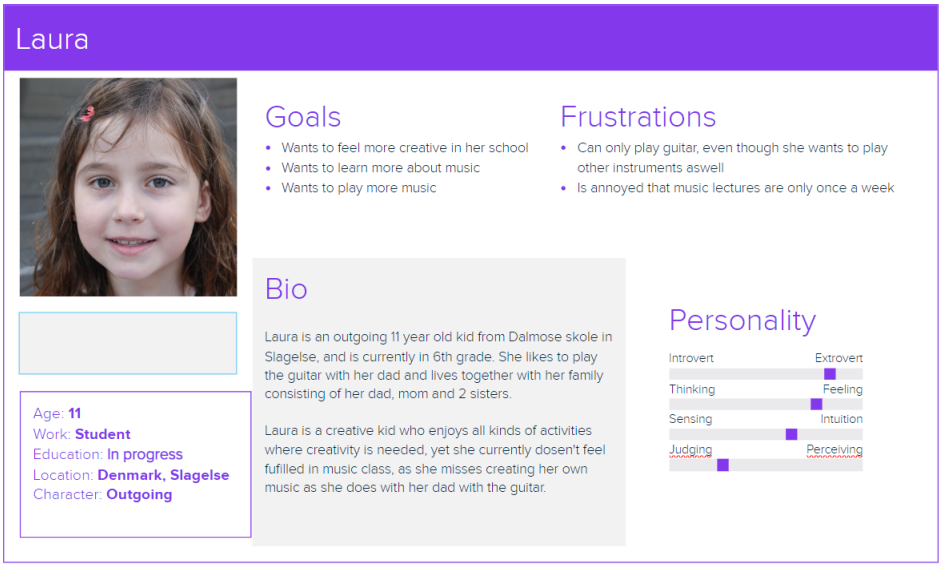


Figure 2: The first persona, Laura

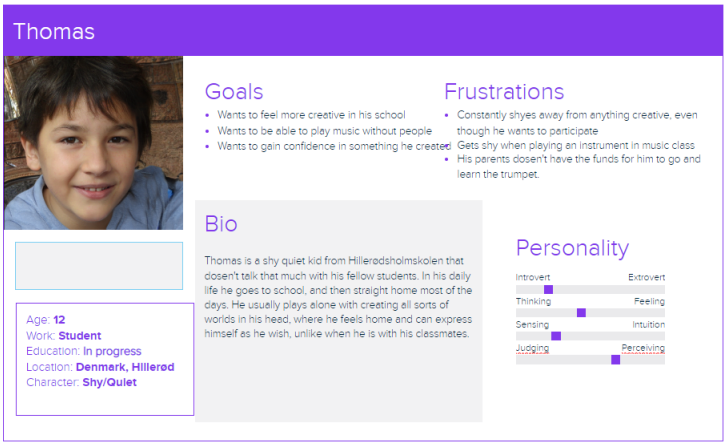


Figure 3: The second persona, Thomas

The use of personas is in creating scenarios where the underlying problem mentioned in the IPS is present, and through it, seeing how the personas would act is the main use case of personas.

Laura comes to school early in the morning for music class. After the class, she was disappointed as she did not feel like she could make a lot of her own music in class, as she could yesterday with her dad and his guitar. She tries to encourage other classmates to play with her, but to no avail, as they do not have the skills to create their own music.

Thomas is at school during lunchtime. He sits in his corner of the classroom, frustrated that he can not talk with anyone. He has an urge to express himself creatively, and the opportunity might come at the next lecture, as it is a music lecture. However, Thomas's disappointment in the music lecture does not give him the tools to create music on his own, and he shies away from playing the drums when asked. The day ends for Thomas, feeling a bit frustrated by his lack of courage about playing, with the urge to be creative still in his mind.

With these stories, it can be seen that Thomas and Laura both need assistance in school with being creative and being pushed toward exploring their musical creativity. Through these scenarios, it can be shown exactly where the target group experiences issues and where the solution to the problem would be most relevant.

The photos in Personas were made on the website: ThisPersonDoesNotExist.com

2.4 Related research

2.4.1 Don Normans Design Princicples

When designing user experience design, there are a lot of different design principles to a and by, and it can be argued that Don Normans design principles are one of the best collections of principles to follow [Norman 2013]. Norman is an expert in the field of human interaction with user-centered design, therefore following his design principles are often a good idea when talking about human-computer interaction. Norman talks about two underling factors that must be thought through when a user uses a product, called the *gulf of execution* and the *gulf of evaluation*.

The gulf of execution is a term that describes the user's action to accomplish a specific goal. The more tasks for the user, the bigger the execution. A good design is therefore a design that limits the gulf of execution so fewer (if only one step) is needed for the user to achieve a specific goal.

The gulf of evaluation is how the user understands the current state of a system. This can be in the case where a mouse is clicked on an X on a computer and a window closes. Here the gulf of execution is good/small as the user gets immediate feedback that also showcases that they did something when pressing the X. A good design is when the user, as just said, does not have to interpret or analyze the system so long that they get confused with it. i.e. the gulf of evaluation is small.

This brings us to Norman's 6 principles, that each can prevent the twin gulfs.

- **Visibility**. Visibility is the basic idea: the more visible something is, the more attention the user will give it. Often, it is necessary to prioritize how much is needed to be visible in the design.
- **Mapping**. Mapping is a definition of the clear relationships between controls and the effect they can have on the design or world. The goal is to make the design feel as natural as possible, so the user will not even think about what the function, control, or application does. A scroll-bar on a webpage is a great example, as it gives the user the option to scroll, and direct, quick feedback is given with the scrollbar so that when it moves, the page moves.

- **Feedback**. Feedback is the principle that says that a user design needs to be as clear as what the user does and what the result is, i.e., what has been accomplished. As mentioned above, the scroll-bar is a good example of how feedback is provided, as it gives a form of immediate feedback to the user that the correlation between the bar and webpage is valid and that the movement of the bar is in sync with the webpage.
- **Constraints**. Constraints are the principle behind limiting user interaction. This is usually done to signify the next action the user needs or to nudge the user in the right direction. An example of this are door handles that can only be opened when pushed down, i.e., a constraint is given in that the door can only be opened with the door handle, yet a signifier is given that the door handle is the right way to open the door.
- **Consistency**. Consistency is the principle that the same action must cause the same reaction each time, and visual consistency is also needed when dealing with visual design. An example is a remote that always turns off the TV when pressing the power button. Another example is how Facebook is notorious for their use of the specific blue color; therefore, they have visual consistency.
- **Affordance**. Affordance is the principle that when a user sees a product, they have to know how to use it, or at least the product needs to give a clue or hint on how to use it when looking at it. This can be a bottle with a twist bottle cap that is indicated with arrows or a lamp that has a button to turn on with. Essentially, the stronger the affordance, the easier it is to guess how to use it based on looking at it. [Enginess 2014]

2.4.2 Color Association

Color perception and association in humans are influenced by a multitude of elements, such as cultural background, psychological effects, and practical use. Proficiency in color theory is crucial in domains such as design, marketing, and data visualization.

Color can be used strategically in design to improve visual appeal, draw attention to key information, and distinguish across categories. A well-designed color scheme may swiftly express the message and direct viewers' attention. In design, a few color schemes are frequently employed:

- **Monotone Achromatic Scheme:** makes use of gray, black, and white hues to produce a striking yet sometimes boring appearance.

- **Monotone Chromatic Scheme:** involves changing the saturation and luminance of a single color to create a unified effect.
- **Analogous Hues Scheme:** uses complementary hues to create harmony on the color wheel.
- **Complementary Color Scheme:** Employs colors opposite each other on the color wheel, offering high contrast and visual interest.
- **Triad Color Scheme:** Uses three evenly spaced colors on the color wheel, ensuring balance and vibrancy

[Wegman and Said 2011]

2.4.3 Digital musical instruments

The field of digital musical instruments (DMI) is a growing field [Frid 2019](Figure 3) with exponential potential and flexibility for expression of musical creation, propelled by human creativity and advancements in computing power efficiency. The concept of DMIs can be defined by three parts, as Robert Moog in 1984 did: "*the sound generator, the interface between the musician and the sound generator, and the tactile and visual reality of the instrument that makes a musician feel good when using it*" [Moog 1988]. The concept is also replicated here [Wessel, Wright, and Schott 2002], with one of their points added being "*Metaphors and conceptual models that determine the response of the software to the gestures*". Whereas a sound generator is a broader term that can refer to any type of software capable of producing sound, the most common use of sound generation being the synthesizer.

These modular systems start with the human input, commonly called gestures, made on the control interface, which then get fed into the sound generator, which can include various sound processing units and ultimately output sound interpreted from the gestures. Metaphors and conceptual models can also be called mapping strategies and are the designed link between these two modules, or the process of relating and transforming data from one place onto another. The right mapping is the key to the interaction with the instrument, as it determines how the music is played.

Because the inherent relationship between the human performers' interaction / input and the sound synthesis device parameters is independent, there is no implicit way of mapping

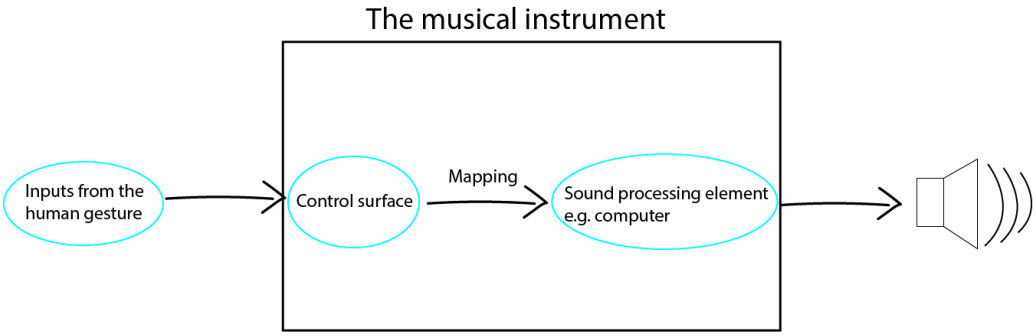


Figure 4: Illustration of the process of sound generation with DMIs [1]

the two modules to each other, but there are some common types of mapping to use. Three strategies that can be devised from the two sets of parameters (control surface and sound synthesizer) are one-to-one, one-to-many, and many-to-one communication. [Hunt, Wanderley, and Kirk 2000]

For the goal of creating a pleasing sound from the use of the input device, some characteristics should be prevalent, according to Hunt and Kirk [Hunt, Wanderley, and Kirk 2000], and summarized and listed by Ghamsari-Esfahani [Ghamsari-Esfahani 2014]:

- Dynamic interaction between humans and computers, with no predetermined order
- Continuous control rather than a fixed menu of choices
- Real-time instant responsiveness to the user's movements
- Physical and Multi-parametric controls that require learning until the actions become automatic
- Continued practice leads to increased competence and control.

Control type interface In a review article published in 2019, by the KTH Royal Institute of Technology, on musical interfaces and inclusive music practice [Frid 2019], they identified and analyzed 83 instrument control type interfaces and marked them into categories based on their main mode of interaction. The instruments categorized were called ADMI (accessible digital musical instruments), which is a branch in the DMI, meaning a specific focus on people with health conditions, but it can still give a general direction of the trends for DMI as a whole. [Frid 2019]. (seen in figure 4 in the article - Page 9) The result showed that the majority of the control types were tangible/physical, with their definition being "physical objects that can be touched or set in motion in order to produce sounds".

2.4.4 Tangible interface and physical manipulation

In a pursuit for flexible and efficient human-computer interaction, the design of tangible user interfaces (TUI) has garnered increasing interest, especially in the educational scene. Among many interfaces, TUI's have made a name for themselves in the last 40 years in the field of human-computer interaction. TUI's are interfaces that augment the digital world with the physical world. The interface allows the user to engage and interact with digital information, through the manipulation of tangible objects [Sudsanguan, Tangwannawit, and Chintakovid 2021]. The manipulation is detected by the computer system through the embedded sensors.

In a systematic review titled "Tangible Interfaces in Early Years Education," researchers Lea Dujic Rodic and Andrina Granic identified and analyzed 155 studies published between 2001 and 2019 [Rodi and Grani 2021]. The review explored challenges in TUI design and identified the relationships among different forms of tangible objects. The study identifies three primary forms of tangible objects that form the focal point of the majority of the research: Manipulatives, tabletops, and tablets.

Manipulatives Manipulatives involve moveable objects from the physical world that users control through direct manipulation. Various technologies are used to make control a reality. Bluetooth is, for instance, used in *Follow Your Objective*, a tangible system where you program a robot's behavior. Some also use radio frequency identification (RFID) tags. These technologies are all examples of computationally enhanced manipulatives, also called digital manipulatives. In the review, 104 out of the 155 studies used manipulatives. That makes it the most popular form of tangible object among the other two. The physical and spatial affordances of manipulatives might play a role in why this is.

Tabletops

A tabletop refers to a digitally enhanced table on which digital information is displayed. Users interact with the table by touching the tabletop surface or moving physical objects on it. Tabletops make it seamless for multiple users to interact simultaneously. TangiSense is an example of a tabletop that collects information on objects you place on it using RFID. Tabletops, when compared to manipulatives, face more spatial constraints. One notable challenge lies in making the tabletop interface more mobile and flexible. The limitation in space can pose difficulties in achieving the desired level of adaptability for the interface.

Tablets

Tablets are mobile computing devices with touch-screen displays. For instance, a child may observe changes in a virtual environment while interaction takes place on a tablet. Despite manipulatives being the most dominant form of tangible object, the researchers did not find any distinctive advantage in any of them. In particular, studies show that children have been encouraged to participate and collaborate when using tablets in a digitally shared collaborative space. All the forms serve various purposes in various fields.

2.4.5 Why Tangible interface

Considering the broad spectrum of interfaces in the world of human-computer interaction, the tangible interface is an interface that encourages learning, playfulness, and collaboration more than any other. The tangibility allows the physical objects to be positioned and combined in creative ways. The interface offers a great variety of configurations that encourage the user to experiment and explore the problem space. As seen in the educational field, learners and the hands-on experience that the TUI provides are utterly straightforward and easily comprehensible in many cases, making problem-solving an insightful experience [Sudsanguan, Tangwannawit, and Chintakovid 2021].

In a Chinese primary school, object-oriented programming (OOP) was taught to children using Tanpro Story, a TUI-based game that uses physical blocks and LED pads to control a character in a story [Qi et al. 2015]. The blocks had programming symbols that the 69-year-old children had to decipher in order to create the correct arrangement of blocks. The motivation for the researchers to use the tangible interface rather than other interfaces was that the interface was a developmentally appropriate practice for these young children.

2.4.6 Digital Audio Workstation

The information presented here about digital audio workstations (DAWs) is gathered from the book 'The Singer-Songwriter Handbook' by Mark Marrington. [Marrington 2017] A digital audio workstation (DAW) is a virtual visual music creation environment that allows input, MIDI data input, and digital audio. In the realm of modern music production, software environments for music production, or digital audio workstations (DAW), stand as a central hub for the creation of music. They have created the possibilities for more freedom for creation in musical practices because they do not need specific equipment or a recording

studio but only their own computers. Through this, it has created a more reachable platform for anyone to get started in creating music. The DAW has many benefits over traditional studio production, with the key being the increased autonomy the individual has, such as version control and building tracks with virtual instruments.

Some common features of a DAW include:

- Main sequencer interface/arrange page
- A mixer.
- A piano roll.
- Samplers.
- Drum Machines.
- Synthesizers.
- Signal processors such as EQ compressors and effects units.

Effects can include reverb, delay, chorus, distortion, etc. Another key element of working in a DAW is the "linearization" that it includes, which is the ability to work in a non-linear timeline that gives flexibility with alternative configurations.

A basic feature of a DAW that supports live experimentation, by testing many versions that the songwriter wants, is the ability to accommodate the songwriting process and workflow. This is frequently accomplished by creating a looping composition using certain audio clips that repeat the beat or the desired portions for as long as the artist chooses. Looping not only facilitates the writing process, but it also improves the song's fluidity and flexibility by allowing for real-time involvement. The loop paradigm is emphasized by DAWs like Ableton Live, a digital audio workstation/software, as a dynamic instrument that allows songwriters to make on-the-fly arrangement modifications. Ableton Live, for example, lets the user hit keystrokes to start and stop different parts of a song, making it easier to segue smoothly between verse and chorus and keeping the content open-ended. With rapid feedback loops, this method not only keeps the flow going, but also continuously inspires and improves it. Furthermore, as songwriters such as Bradford Cox show, the loop paradigm may function as a basis upon which whole compositions are constructed, beginning with basic rhythmic components and gradually adding layers of texture. This approach has influenced band-

based genres as well as computer-based ones, demonstrating the profound influence of DAW features on contemporary musical composition.

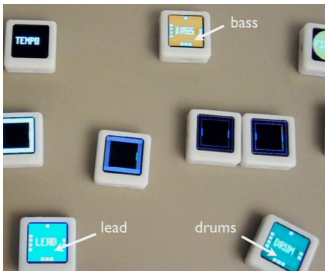
2.5 State of the art

2.5.1 Siftables Music Sequencer

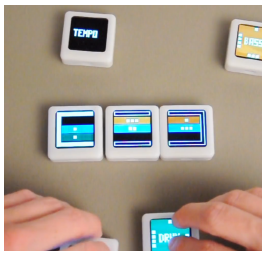
Siftables Music Sequencer (S.M.S.) was made using an intractable interface called Siftables, created by Sifteo, Inc. [Merrill, Kalanithi, and Maes 2007]. The main idea was a hands-on interaction with digital data, unlike a normal computer input such as a mouse and keyboard. Through this, it can be seen as a digital music instrument. *In a nutshell, siftables is a interactive computer the size of a cookie. They can be moved around by hand. They can sense each other. They can sense their motion, they have a screen and a wireless radio* - David Merrill, TED2009, Feb 2009

Each of the S.M.S. has four variations, where they act like sounds in average music, such as lead, drum, and bass. One of the four variations can then be injected into a “blank” sequence siftable. The injection works by bumping the siftables into each other. There are also effects that the user can control, such as reverb, volume, tempo, and filter. The effects work by "attaching" them to the sound siftables and tilting the "effect" siftable. Volume and tempo siftable affect the entire sequence.

(a) A "Bass" siftable showing the 4 usable variation



(b) The "sounds" siftables with the "blanks" being in the middle of the image



(c) A showcase of how the siftables look like when the user starts "injecting" some of these siftables into a "blank" sequencer

Figure 5: A, B & C shows the siftable and its association with the "blanks" sequencer. [Merrill 2009]

Following Don Norman’s design principles (See section 2.4.1), the siftables and their types are always visible, drawing the user’s attention. However, the mapping may be difficult for some

users due to the four variations of siftables shown by the small square dots on the sides. Users might not realize that touching different sides will produce different outputs. This relates to the principle of consistency; while the siftables themselves are consistent, it requires the user to understand that the four variations are not the same. For example, injecting variation 1 into the blank sequencer will always produce the same output, but if a user fails to notice the dots, they may perceive the siftables as inconsistent. The feedback on the siftables is great, as the output depends on how the user sets it up, providing real-time feedback on how their actions affect the output.

in summary, The Siftables Music Sequencer (S.M.S.) is a digital music instrument that utilizes a novel interface called Siftables, which was developed by Sifteo, Inc. to facilitate hands-on engagement with digital data. Users can physically operate the device, which is characterized as an interactive computer the size of a cookie, to interact with musical sounds like lead, drum, and bass. Through physical contact, these sound differences are sent to a "blank" sequencer siftable. Furthermore, by connecting effect siftables to the sound siftables and modifying the effect siftable's orientation, users can regulate effects like reverb, volume, timing, and filter. The design has a strong emphasis on visibility and real-time input, but some users might find it difficult to understand the functionality, which is represented by tiny dots that indicate various sound variations. As well as inspires our product's modularity as well as how the blocks can affect each other.

2.5.2 GarageBand

Apple Inc.'s GarageBand is a digital audio workstation (DAW) that is user-friendly and suitable for both amateur and professional musicians. It is a component of Apple's iLife software package, which is meant to make it simple for users to make podcasts or music. The user-friendly design of GarageBand enables novices to begin creating music right away, but it also has strong capabilities that experienced musicians may utilize to create intricate compositions.

GarageBand's extensive library of instrument sounds and loop tracks, which users may mix and match to create music, is one of its main features. By enabling people without access to real instruments or recording facilities to create high-caliber audio from the comfort of their homes, these technologies democratize music production. Because it lowers the entrance barrier to music creation, this change has important ramifications for both the democratization

of music production and music education.

Figure 6: GarageBand UI
[Apple Computer 2020]

GarageBand is adaptable and scalable because it can accommodate a variety of external hardware and software instruments. To record live performances, users can connect MIDI keyboards, guitars, and other instruments straight to their Macs or iOS devices. The program can also be integrated with Apple's Logic Pro X and is compatible with professional plugins, giving users a route to more sophisticated music production. One notable aspect of GarageBand is its pedagogical potential. It is frequently used in classrooms to educate students on how to compose and produce music. The program is a useful resource for music education since it comes with a number of integrated lessons for the piano and guitar. Real-time feedback and educational videos by experienced musicians are included in the interactive and user-friendly lessons.

In terms of design philosophy, it adheres to Donald Norman's guidelines for visibility, feedback, consistency, and affordance [2.4.1]. The user interface makes learning intuitive and fun by giving quick feedback on musical production operations along with clear visual signals. But for newcomers, getting the hang of GarageBand's more sophisticated capabilities

can be difficult, as it takes some time to comprehend how various settings and tweaks impact the song's ultimate output [Bell 2015].

In summary, GarageBand is a platform that encourages creativity and learning rather than merely being a tool for creating music. By bridging the gap between amateur enthusiasts and professional musicians, it offers a scalable setting for the production of music. GarageBand continues to be an essential tool in the digital music production scene, encouraging the next generation of artists and producers with regular updates and additions from Apple. [Apple 2024]

2.5.3 Lego Mindstorm

The LEGO Group has developed a platform called LEGO Mindstorms with a tangible interface that puts robotics and programming in the hands of students, educators, and hobbyists worldwide. Programmable bricks, the central component of every product constructed with them, are the foundation of the LEGO Mindstorms concept. "At its essence, LEGO Mindstorms embodies a playground for the imagination, a tangible interface to the digital world, transcending traditional computing devices like the mouse and keyboard. It is about bringing your ideas to life in a way that is both intuitive and deeply engaging."—David J. Perdue, Competitive MINDSTORMS : A Complete Guide to Robotic Sumo using LEGO MINDSTORMS - June 2013

Numerous sensors, motors, and hundreds of LEGO Technic parts are included in every LEGO Mindstorms kit, enabling the building of an endless number of robotic creations. The possibilities are almost endless, ranging from robotic arms that sort colors to self-navigating vehicles that navigate mazes. LEGO Mindstorms is known for its versatility and for making it simple for users to make changes to their ideas. Through this LEGO add-on, the user is able to create whatever they can imagine while including robotics and programming.

LEGO Mindstorms supports many more programming environments than their official LEGO Mindstorms EV3 software, like third-party options like Microsoft MakeCode and Python. Through this, it caters to a wide range of skill levels and educational purposes. This accessibility ensures that beginners can easily start with visual programming interfaces, while more experienced users can delve into text-based coding to unlock the full potential of their

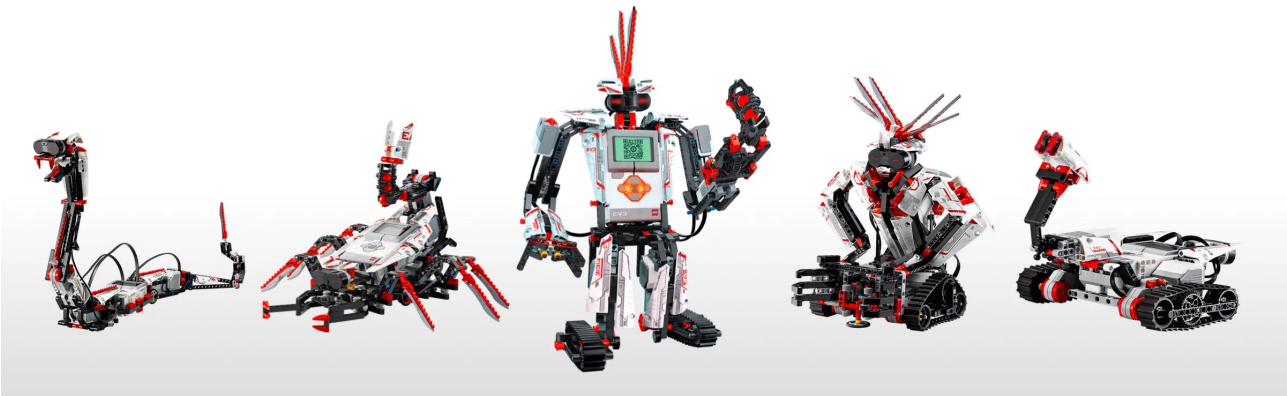


Figure 7: A Picture of Lego Mindstorm creations
[Lego 2024]

robotic creations. This pedagogical approach advocates learning through making, encouraging students to engage in hands-on problem-solving, thereby deepening their understanding of scientific and mathematical principles [Afari and Khine 2017], while it is still versatile enough to be used by more experienced users.

With its physical components and real-time programming outcomes, LEGO Mindstorms excels in visibility, feedback, consistency, and affordance in line with Donald Norman's design principles. However, learning how to mapthat is, comprehend how modifications to code impact robot behaviorcan present a barrier for beginners. To overcome this, they must develop a close relationship with the design process and the logic of the system, which is a fulfilling and instructive trip. To sum up, LEGO Mindstorms is a combination of creativity and engineering, pleasure and learning. It represents a link between the digital and the tangible interface, enabling users to investigate the fields of programming and robotics in an approachable and fun way. LEGO Mindstorms aims to inspire the next generation of inventors, problem solvers, and tech enthusiasts with its ongoing progress. [Lego 2024]

3 Delimitation

Determining the limits and extent of the product is essential. Delimitation guarantees a clear grasp of what is included and omitted from the study, and aids in concentrating on particular elements that are most pertinent.

3.1 Exclusions

The following areas are outside the purview of this project in order to keep things focused:

1. **Advanced Music Production:** The system is not meant to take the place of specialized music production software, even if it does provide basic music creation and editing. But rather create interest in music creation for the target group. It needs to cover the feeling of exploration, not education.
2. **In-Depth Psychological Studies:** While the report address the possible emotional and cognitive advantages of music education, in-depth psychological evaluations are outside the purview of this research project.

3.2 Verification of the target group

Through a study conducted to verify the problem area, it was determined that actively creating music considerably improves cognitive functioning. This effect is especially noticeable in children, who benefit from early musical instruction not just in terms of their cerebral growth but also their emotional and social development. These results emphasize how crucial it is to target children as the main audience for music-related exploration interventions (See section: 2.1.1). With the interview with *Strøm til Børn*, insight into the process of giving children in the age group 9-12, opportunity to create music in their school, and gave guidelines from their existing experience to follow.

3.3 Scope & Focus Areas

Through the study in the analysis section and of different technologies in the state of the art, it highlighted the importance of incorporating tangible interfaces to enhance learning, playfulness, and collaboration. A tangible, modular control interface would be the product that will be made for enabling such musical creation purposes. Through the use of a digital

audio workstation (DAW), musical experimentation could be explored by communicating with the interactive modular interface. This in turn would create a form of digital musical instrument by using tangible, modular controls mapped to a DAW to experiment with sound production. The design of the system would follow the design philosophies of Don Norman and put the concepts into practice, ensuring a user-centered design. The design should also incorporate a well-thought-out color scheme to ensure clarity and usability.

3.4 Integration of State of the Art

Through the state of the art (See section:2.5), the project aims to draw on the technologies and research, gathered from them, to be able to enhance the design and functionality of the product. Here what the aims on integrating from each product The tangible block design by the Siftables Music Sequencer and the modular creation of sound by connecting the blocks together to provide a simple and enjoyable experience, will be the inspiration for how the mechanics of the physical tangible part would operate. GarageBand's huge sound collection and user-friendly interface will be seen as the digital audio workstation to seek guidance from. It ensure accessibility for users with different degrees of musical expertise. The modular and interactive design of the Lego Mindstorms system, which encourages user creativity and exploratory learning.

3.5 Final Problem Statement

Our final problem statement is derived from our emphasis areas and the incorporation of insights from State of the art, therefore our final problem statement is:

How does the integration of a hands-on modular music block with interactive simple digital audio station influence middle school children's engagement in musical exploration and experimentation.

This statement captures our intention to improve musical experimentation and creating through the use of digital integration and physical interaction, offering a thorough and interesting exploration process.

4 Methods

This section of our project report delves into the methods and procedures used to conduct testing that were used during this project. The section will cover the different test methods that were used in: Pilot test, usability tests, and the final test. While also describing the methods used for creating the product and visualization of target group.

4.1 Iterative development model

The Iterative model is the idea of using a system of repeated cycles, through which this is allowing to make changes throughout the development of earlier part of the products and software. Each of these periods is called an iteration.

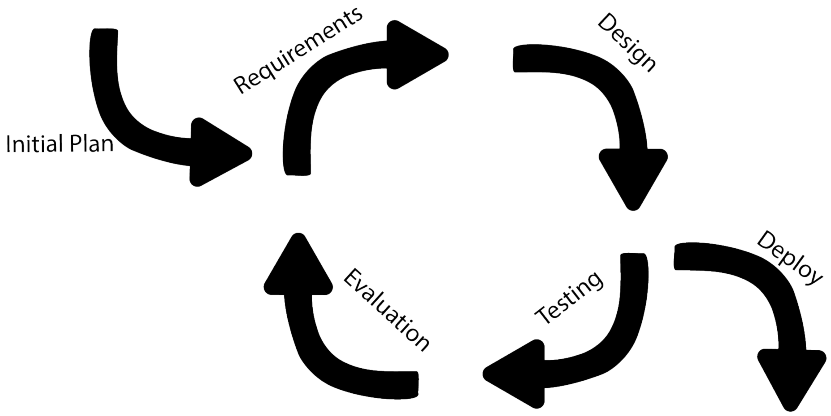


Figure 8: Diagram of the Iterative Method

The different steps in the iteration are:

- **Requirements:** are gathered for what the products need to fulfil, to get the desired products
- **Design:** Outlining how it should be designed to meet the identified requirements.
- **Testing:** Here the product is tested to see if the implementation is working.
- **Evaluation:** In the last phase, to check if the behavior and validity of the devolved product. if the product did not reach it, the iteration starts over again
- **Deploy:** is where the changed to the product established in the earlier iteration, are implemented

[javatpoint 2024]

Usability testing will be carried out using this methodology up until the point at which the SUS-scale median is exceeded, with it being 68. Making sure people can use the items to their maximum capacity and that the components' usability is understandable is the goal. As such, this methodology ensures the best possible user experience (UX).

4.2 First usability test

The purpose of the first usability test was to evaluate the product's design and functionality, aiming to uncover user issues and areas for improvement. The goal was to highlight features and interactions that are unclear, and, therefore, refine them through this iterative testing while also gaining insights into user behavior and interaction patterns.

4.2.1 Pilot test

A pilot test was carried out of the entire procedure prior to the actual test. This was done to make sure the task was clear and comprehensive, which helped to identify any errors that might have arisen during the actual testing phase. Some of the errors included some rephrasing of the tasks in the task sheet, some software errors with volume slider, and some rephrasing in our introduction guide.

4.2.2 First formative test

Participants were recruited by convenience sampling, acknowledging the limitations in representing the target group.

During the test, participants were presented with specific tasks to complete while their behavior was observed and interesting actions, comments, and issues they might encounter were noted down to strengthen the areas that needed improvement. The participant's action was further analyzed with a think-aloud, where the participants openly talked about what they did and why when using the product. A post-test System Usability Scale (SUS) questionnaire was used to gather quantitative data for the iterative improvements. John Brooke developed the SUS test, which allows you to rapidly collect data on the usability of your product via a questionnaire. By using the questionnaire, you can gauge how well your product is usable by rating how the usability was perceived using a Likert scale, which has a score range of 0 to

100. [Brooke 1996]

The procedure for the usability test is as follows:

- An introduction to the test's purpose and a brief overview of the product's features.
- Tasks to guide the participants through the product and encourage them to try to complete them with little to no help.
- The test participant openly talks about what they do with think aloud
- Completion of the post-test SUS questionnaire.
- Debriefing session, providing participants with an opportunity to offer additional feedback.

Full set of tasks in appendix A.10

4.3 Final test

For the final test, it was made with the intention of understanding the effectiveness of the product. Similar to the prior usability test, the user has to go through different tasks that guide them through the system.

Before the test begin, a pilot-test was conducted on a student, with any data being recorded, to see how it functions as a whole. The full list of changes found through the pilot test can be found here (See Appendix: A.17)

Because of the circumstances of not getting an offer to be able to do the final test on the intended target group, despite reaching out to multiple schools and teachers, the participants were instead gathered from the university. The test measures that were gathered were both a system usability score and a user engagement score. Additionally, in-depth post-session semi-structured interviews were conducted with five randomly chosen participants.

4.3.1 Procedure

The final test was carried out, through this certain procedure:

Firstly, the test participants would be read this statement:

"*The Product, that we are testing today, is a musical instrument slash toy, that function by creating music by placing blocks on top of this to create different musicals sounds. Before we start, I would like to tell you what being recorded of you: Firstly we are gathering what age category, you are in, what gender you identify as and lastly how yourself would rate your own knowledge of music creation, afterward the test, there will be two questionnaires one is a System usability scale and the other is user engagement questionnaire. None of the data, can be used for personally identifying you. If this is alright with you, we would like you to sign this consent form, and if you at any time after the test, want to take back your consent, you can contact at this email.*"

When the test participant has signed the consent form, they would be asked to fill out the demographic questionnaire (See Appendix: A.14). After the test participant has completed filling out, the test could begin. The test participant is informed to start at the number 1 task, which is reading a manual (See appendix: A.9) to understand the program, and then afterward go through the other tasks one at a time. When they have finished a task, they would be told, and can continue on to the next task. The tasks take the test participants through the system and lastly an opportunity to play around, with the last task being having to recreate a specific sound the test giver plays. This task tries to encourage exploration and to test participant's own creativity (All tasks can be seen here A.12).

When the task has finished, the test participants are asked to take the two questionnaires. If the person is chosen for a random interview, they would be asked to be interviewed.

4.3.2 Setup

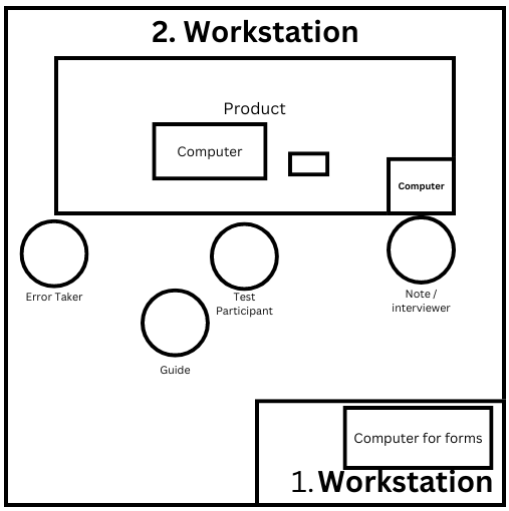


Figure 9: Sketch of the test room

The setup is conducted in a small room, that can be closed to ensure that the test participant, can do the test without interruptions. There are two work stations, one for answering the surveys and one for doing the test. Inside the room there are three researchers, that have 3 different functions:

- A guide + helper
- A note taker, both of verbal and non-verbal feedback + interviewer
- An error recorder

The workstations are separated to contribute to the creation of a controlled environment by lowering outside factors that might influence test findings and participant performance.

The reason founded for the different roles for the researcher was: When given each researcher a distinct task, to guarantee that every component of the test is covered without overburdening any one person, therefore maintaining a high reliability. Details of the interactions between the participants are watched and documented.

The reason founded for self-reported data: Integrating self-reported data (questionnaires, surveys) with observational data (errors, behavior) yields an understanding of the user's experience and the performance of the product.

The reason for clear task division: Participants can feel more at ease and concentrated when

there is a clear task division and systematic coaching, which can produce more accurate and trustworthy data.

4.3.3 Interview

For the interview question, the aim was to get feedback on the participant's experience with the product. The interview questions were delved into three main categories: Their thoughts on the hands-on blocks, reflection on features and theoretical question about how they think, the target group would have met the product.

Here are the interview questions in its correct order:

- How intuitive was the translation between the physical world and the digital?
- How did the hands-on blocks influence your overall experience?
- What feature did you find especially exploratory
- What aspects did you enjoy most about the product
- What aspects were challenging / frustrating about the product?
- In theory, if you were a middle school child again, would you use this as a musical instrument?
- What factors would you say contributes mostly to the effectiveness of the tool for children?
- Last but not least, What would you like to See for future implementation?

In general, this arrangement and process are intended to establish a comprehensive and efficient environment for usability testing, guaranteeing that the researchers may obtain specific and significant information about the usability and user experience.

4.3.4 User Engagement Survey (UES)

The Final test made use of two surveys, the system usability scale (See section: 4.2.2) and The User involvement Scale (UES). The UES is an extensive self-report survey created to assess different aspects of user participation in a range of digital environments. For the testing done, a shorten version of the UES was chosen, this is mostly because the length of it, combined

with taking the SUS questionnaire before was faster for the participants. The shorten version is divided into four dimensions:

- Focused attention: which measures the degree of how much the test participant is absorbed in the interaction
- Perceived usability: which assesses the ease of use and any negative feeling from the test participant
- Aesthetic appeal: that evaluates the visual attractiveness of the interface for the test participant.
- Reward Factor: it's a combination of overall success, future willingness, curiosity, and the sense of being "drawn in".

[OBrien, Cairns, and Hall 2018]

The reason for choosing User Engagement Survey has several reasons, since it's methodological robust. The UES provides a multifaceted method of measuring user engagement that takes behavioral, emotional, and cognitive factors into account. In-depth measurement like this is necessary to capture the subtle ways users interact with digital systems. It assesses factors that are essential for fully comprehending the user experience.

4.3.5 Coding Procedure

In order to derive significant insights from the information gathered through interviews, the final test's coding process includes Content Analysis and Keyword Analysis.

Content analysis

A research method called content analysis is used to examine textual, visual, or audio material in an organized way in order to find themes, patterns, or hidden meanings. The first step in the content analysis process is defining the objectives and specific questions the analysis aims to answer. This focused attention ensures that the analysis adheres to the research goals. Selecting a representative sample of the material to be examined is the next step, which is crucial to maintaining the validity of the findings [Hoonaard 2008].

Next, a coding scheme that includes several categories and subcategories pertinent to the study questions is created. The coding procedure starts after the coding scheme is established. This entails carefully going over the material, applying the coding scheme to the passages,

and allocating codes to them. To provide accurate and meaningful coding, this approach necessitates a thorough comprehension of the content.

To guarantee consistency throughout the coding process, intracoder reliability is employed for the content analysis. The term "intra-researcher coder reliability" describes how consistently one researcher codes the data across time. This was essential to preserving the analysis's integrity because it makes sure that the same coding choices are made consistently throughout the dataset. The dependability of the results was improved by identifying and resolving any inconsistencies by coding the data many times and comparing the outcomes [Hoonaard 2008].

Interpreting the data in light of the study's goals is the last stage. This entails making judgments based on the themes and patterns found, which are subsequently recorded in an organized manner. To effectively and concisely communicate the most important ideas, the data are presented utilizing tables, charts, and narrative descriptions.

The coding and analysis process guarantees a comprehensive and rigorous assessment of the qualitative data by adhering to these methodical methods, offering insightful information about the data. In order to get thorough results, the methodology follows best practices in qualitative research by combining both keyword and content analysis. [Hoonaard 2008]

Keyword Analysis

Gathering any relevant textual information from interview transcripts and other sources is the first step in the keyword analysis process. After that, this data is cleaned up by eliminating any superfluous details like filler words, extra punctuation, and inconsistent formatting. This increases the accuracy and dependability of the results by ensuring that the text is clear and prepared for analysis.

Python was chosen for the keyword analysis because of its strong text processing libraries and tools. The text data was first tokenizedthat is, broken down into individual words or termsusing Python. In order to help identify the keywords.

After all text data is ready, each keyword's frequency in the dataset can be ascertained through a Python frequency analysis. The most frequently used terms can then be clearly visible, and they can be subsequently categorized or thematically arranged according to their significance

and context for the research questions.

Lastly, a visualization of the results can be provided, emphasizing the most popular keywords and the key themes that the analysis had revealed.

5 Design

Since the design of the product is divided into two parts, the hardware part and the software part, the design chapter has also been divided into these two categories. The product is both a physical modular building block instrument that constructs the music and a digital interface where you modulate, control, and modify the music.

The initial design concepts were theoretical prototypes of how the product is designed and functions, but they were not made as prototypes. The design concepts evolved over time, based on our own understanding of the possibility of implementation. The evolved concept of the design was made before testing were conducted, and therefore still in the first iteration, and is the guideline for the implementation of it.

5.1 Design Requirements

Based on the analysis and insights from the state of the art, the following design requirements are derived for the proposed hands-on modular music block system. These requirements ensure that the system is interactive, engaging, and educational for middle school children, while adhering to key design principles for effective user experience and containing the functionality that the product requires.

5.1.1 Physical design requirements

Physical design Requirements	
Funtional	**Non-Functional**
Have a way for Arduino to be able to detect the blocks	Use a voltage divider with a known resistance, so Arduino can detect change
different blocks are uniquely identifiable	Using resistor that give a unique combination value
Adjustable blocks parameter	Resistor in parallel that affect the whole column
The Blocks can complete the circuit without being hard-wire to each other	using copper tape on the faces so the electrical currents can travel across the blocks
The blocks are modular	The blocks can be connected and disconnect without tools
The block snap to each other	Use magnets on the faces that can be connected
Translate analog to digital	Using Arduino built-in analogRead()
Have a main hub that other blocks can connect to	Having a mainblock that house the Arduino with on z-axis connectivity
Easy to handle by using light and durable material	Built using laser cut MDF board pieces
Enticing for children	Make the blocks be colorful

Figure 10: Design requirements for the physical part of the product

Digital design Requirements	
Funtional	**Non-Functional**
Provide music sounds that interact seamlessly with the digital audio workstation (DAW) for music creation.	Ensure controls are intuitive and easy to understand, with visual components clearly indicating their function.
Implement real-time feedback for actions performed with the software, such as sound generation and modification.	Provide clear, immediate feedback for user actions (e.g., visual cues for block placements).
Develop an intuitive, engaging interface tailored to middle school children.	Ensure important information and controls are easily visible and accessible.
Use a consistent color scheme to differentiate various part of the software	Maintain consistent visual and functional design elements throughout the application.
Allow users to apply effects by matching physical actions with corresponding digital outcomes.	Provide adjustable settings for audio and visual feedback to accommodate different user needs.
Design activities that progressively introduce more complex musical concepts as users advance.	Ensure the system operates reliably without crashes or significant downtime.

Figure 11: Design requirements for the digital part of the product

The goal of the design is to give as much freedom to the user of the product as possible, while not overwhelm them with too many options.

5.2 Hardware design

5.2.1 Initial Concept

The initial idea for the hardware part was to be able to have one center block with an embedded circuit and have five sides that would be running a connection to a computer via an Arduino. You would then be able to connect so-called parameter blocks with six sides, onto this center block. The initial idea for the block placement was that they had all three degrees of freedom (X, Y, and Z axes), so you could stack the parameter blocks in all directions and any combination of block types. Then based on which side of the blocks, both the center block and the parameter blocks, it would change different parameters, for example placing blocks on top would increase the frequency.

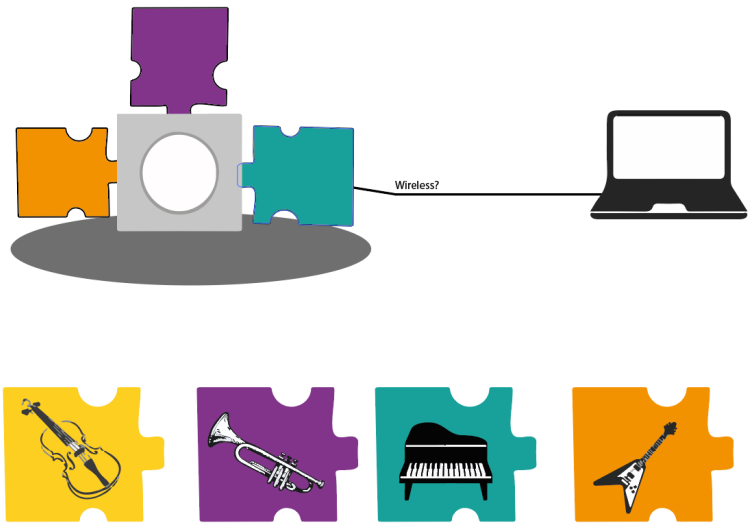


Figure 12: Illustration of initial concept.

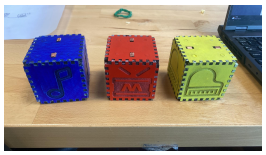
The center block itself would then be able to play in a changeable tempo that loops on repeat, and when these parameter-blocks were to be added, they would also add their sound to the loop.

5.2.2 Evolved Concept

Initially, issues with the degree of freedom of the blocks became apparent that the design was not optional for implementation according to the guidance received, and the initial design was modified to one that would make more sense from a physical and electrical circuit standpoint. It was changed to have 1 degree of freedom, being the Z axis, and the center block has become a platform where the different parameter blocks can be stacked in columns in a 3x1 grid. The X and Y planes from the initial idea could then be translated to be implemented through programming and not physically. The evolved design concept of the blocks also included the specifications of block types, instead of only colors identification. There will be 3 different types: instrument block, drum block, and effect block.

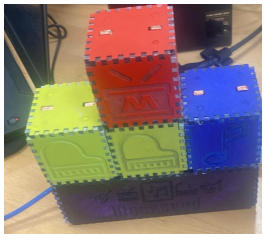
So instead of the blocks relative placements to each other, they can only stack in the Z direction, and each block in the 3x1 grid can be built upon, and the type of change that would be added, is controlled on the software side.

The center block has also been modified to be a sort of triple-row platform where the parameters block gets stacked upon, called the mother-block.



(a) The different kind of blocks that can be put on the mother-block

(b) a picture of the mother-block



(c) A showcase of how it looks when the music block is stack on the mother-block

Figure 13

Materials and Construction

The material of the blocks has to be made of a material that is both durable and will not easily break, but also of a customized material that is not too heavy and will not interfere with the implementation. The material chosen should also be able to quickly produce the blocks because of the iterative implementation process, so different sizes and designs could be tried without spending excessive time.

Metal materials would not really work since there would be extra step for insulating the blocks and also the weight, also due to the accessibility and affordability that are available. The two main options that were available were 3D printing or laser-cut wood. where the laser-cut option was chosen based on the quickness and durability. Through these arguments, wood was chosen as material for the block.

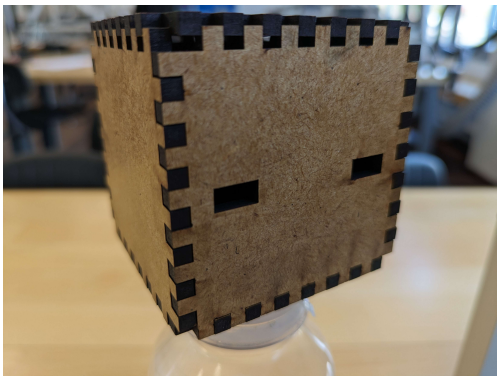


Figure 14: A block shown prior to painting

The block needs to be made so that it can be assembled quickly and correctly at the same time. The choice was made to utilize magnets, which enables a simple snap-together assembly. This decision does, however, come with a drawback: the magnets' polarity limits the orientation of the blocks, allowing them to only be lined up in certain directions because of their opposing magnetic poles.

5.3 Design of the blocks

The utilization of symbols on the blocks serves multiple purposes. Firstly, they facilitate the differentiation of various blocks. Secondly, the blocks are designed to interlock in a specific orientation due to embedded magnets, as discussed in the section "Materials and Construction" (See section: 5.2.2). The symbols significantly simplify the process of determining the correct orientation, thereby ensuring that the blocks are assembled correctly. This design feature not only enhances usability but also aids in the correct assembly of the blocks, thereby supporting the user in aligning them appropriately. We found the symbols on a free license site, which can be found in appendix: [A.6]

Figure 15: The symbol shown prior to painting

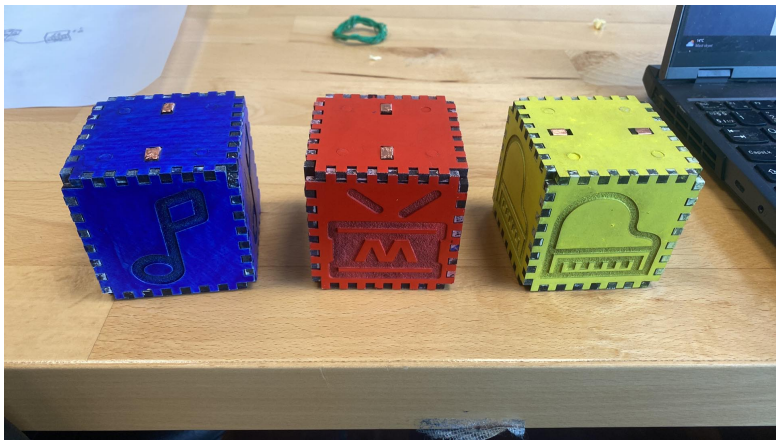


Figure 16: The different colors of the blocks shown put together

5.3.1 Block colors

Ensuring that every block was instantly identifiable in both its digital and physical forms was a key component in the creation of the modular music block system. Bright colors would also help to give more attention to the product, and making it more child-friendly. Through the careful use of standardized colors and visual cues that smoothly connected the analog and digital interfaces, this recognition was made possible. For each sort of block, we employed a consistent color scheme to make them easy to differentiate from one another:

- **Instrument blocks:** Yellow
- **Drum Blocks:** Red
- **Effect Blocks:** Blue

These colors were selected to help users identify quickly and easily, in addition to being distinctive. Both the digital representations of the physical blocks on the software interface

and their digital counterparts were colored using the same palette. The functioning of each block type was easier for users to grasp and recall because of this consistency, and color symbolism (See section: **??**.

We added a color-mixing function to the party blocks in order to improve the system's software intuitive comprehension even more. The visual depiction would change to reflect the combination of the two blocks when an effect block (blue) was attached to an instrument block (yellow) or a drum block (red):

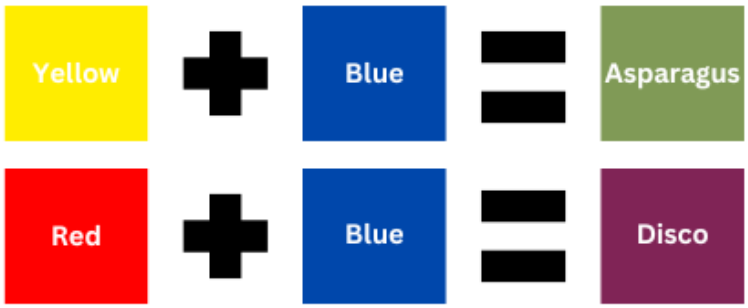


Figure 17: Show how color the block's color give it they or added together

The ability to blend colors not only enhanced the interface's aesthetic appeal but also gave users a quick visual indicator when there were effect-blocks added to the drum or instrument blocks. It made it easier for users to comprehend how various blocks interacted with one another and how it affected the way their musical creations changed.

5.4 Software design

5.4.1 Initial Concept

The initial software was to be a central control panel where the user could control basic parameters of the sound, such as the volume or the overall tempo of the entire track.

5.4.2 Evolved Concept

In the evolved concept of the software control center, it becomes more central and prominent in the entire product, instead of the initial idea of only controlling a few parameters. It is intended that the control hub have an overview of the blocks placed on the control hub block, that is translated from the real world to the main interface. Where the user can click

on the digital blocks to access the modification page, and there customize parameters for the individual blocks placed.

5.4.3 Parameters to control

For the control parameters in the evolved concept, there have been considerations about what to include and what to exclude. Based on the interview with the spokesperson from 'Strøm til Børn' that talked about the importance of limiting the features that the children should focus on, by giving them a structure to start learning the app with.

And on the design principle of constraints, there have chosen some key features of a standard DAW (Digital Audio Workstation) to be included, means there will still be a wide enough range of possibilities for the user to create their intended sound and explore the program, but some of the more advanced feature was excluded to not overwhelm the user, as the product is made for children.

The DAW features to be implemented include:

- Main page, to control volume, speed and play / pause keys
- Simple drum sounds
- Three instrument loops - guitar, piano and trumpet
- Loop based composition
- Simple effect units, including reverb, delay and distortion
- Wet / Dry mixer of said effects

Some of these features will only be available to the user, once the correct block is placed. most importantly, the effect units. This way the modular design encourage the users to engage with different compositions of physical blocks, and encourage exploration. To ensure seamless integration between physical and digital realms, the design restricts access to effect menus in the digital workspace until a corresponding effect block is physically placed. This synchronization allows users to intuitively apply effects by matching physical actions with digital outcomes.

5.5 Design Principles

Don Norman's design ideas have been carefully used in the development of the interactive music software for kids ages 9 to 12, resulting in a user-friendly, entertaining, and instructive experience. The application of each principle to the user experience design is described in the section that follows:

5.5.1 Visibility

The software is design to consistently have the user informed about the current state of the system. Here different way visibility play in to the software:

- If the mother block is not connected, A sizable question mark indicator that displays in the middle of the screen when the product is disconnected makes it obvious that something has to be done (See figure: 18a).
- The waveform and volume control symbols are constantly visible at the top of the interface, giving you real-time feedback on the audio and speed levels (See figure: 18b).
- if a block is not on or a block is incorrectly linked, it displays a red cross beneath them. The red cross turns into a green check mark when a block is linked and positioned correctly, letting users know that the block is being recognized by the system. (See figure:18c)

(a) How the system reacts if the mother-block is not connected

(b) The Waveform and volume control symbols seen at the top

(c) The check-marks that shows when the blocks are connected

Figure 18: Visibility in Block-band

5.5.2 Mapping

The mapping between the digital and real-world have been made by having an interface that closely resembles real-world features. So children will find the engagement more interesting and natural when this method helps close the gap between the real and virtual worlds. Important design decisions are in the iconography, where the software's features should be more readily comprehend because of the usage of well-known and consistence musical icons. (See section: 2.3.1)

These visual signals support the recognition because they are in line with the real-world icons on the blocks. (See figure: 19)

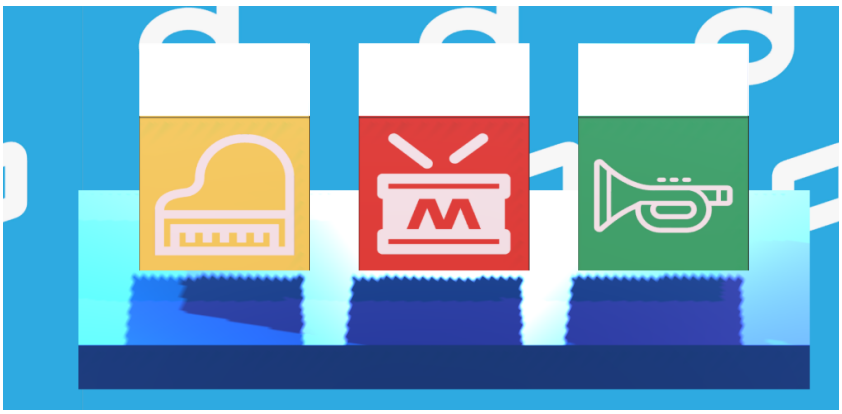


Figure 19: The icons of the three parameter blocks used

The mapping between blocks that are placed on the actual mother-block in real-life shows up in the appropriate spot on the screen, translating the actions that occur in the digital interface in real life.

5.5.3 Feedback

The software provides immediate and clear feedback on user actions through clicking on buttons and interactive features causes them to visually react, letting consumers know that their actions have been recorded, and minimized the gulf of execution.

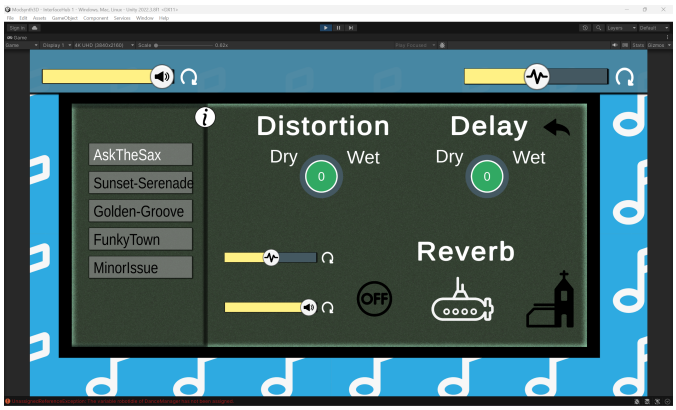
5.5.4 Constraints

Constraints have been set in place, both physically and digitally.

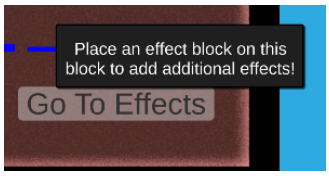
The constraints for the physical blocks is the way that they can be placed on the mother-

block. They have been constrained to only be able to connect via the z-axis, meaning only one degree of freedom. Other physical constraints lies in the size the blocks have compared to the mother-block, being that it's only able to fit one block per pin per row, therefore there is no confusion about where to place the blocks.

In the digital realm, the effects page can only be accessed after an effect block has been set, which helps users comprehend how choices and actions are dependent on one another. (See figure: 20)



(a) Effect page, which can only be access with an effect block on

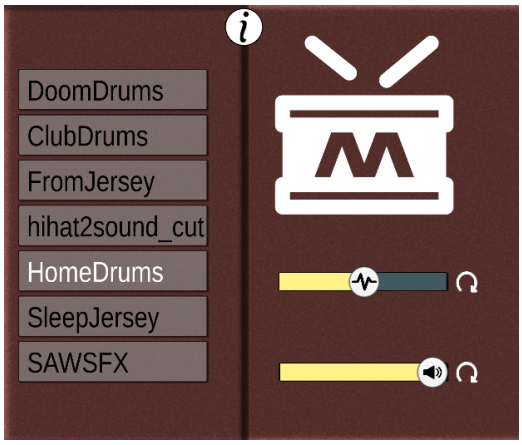


(b) The User being unable to use access effect without an effect block on

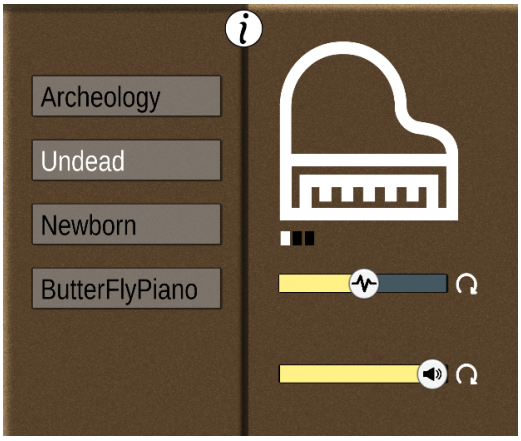
Figure 20: Block feedback

5.5.5 Consistency

This is how the software maintains a consistent visual and functional design, this is done with uniform and identical icons for the blocks and the control parameters for the sounds, as well as the menu pages for the blocks having the same layout. (See figure: 21c)



(a) Drum settings page



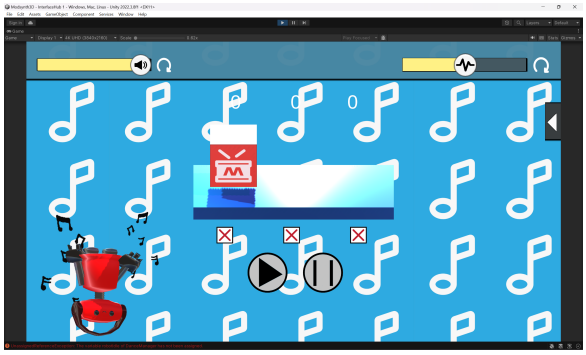
(b) Instrument settings page

(c) The Icon remains the same as party block as a regular block

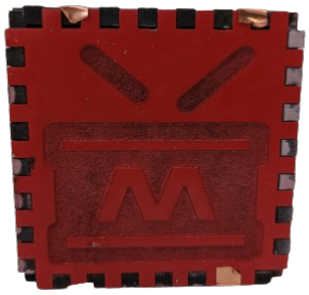
Figure 21: Consistency in the program

5.5.6 Affordance

Some of the visual components that have been designed to indicate an intuitive functionality, are the more widely understood elements, like an information button, a back button and a volume slider, as well as the block shape encouraging modular playfulness, from products like LEGO (See section: 2.5.3)



(a) Drum block shown in software



(b) Physical Drum Block

Figure 22: Affordance in block band

5.5.7 Why it is designed for children

The software's main layout is customized to fit the requirements of children between the ages of 9 and 12, which makes it a useful tool for exposing them to music. Its success is attributed to several important factors (See section:2.1.1):

- **Engaging and interactive Elements:** The software is visually appealing and entertaining for kids thanks to its use of colors, playful graphics, and an interactive mascot. Dynamic answers, like KVN's dancing motions, foster an enjoyable and inspiring environment that promotes ongoing communication.
- **Intuitive and Simple Interface:** Children may simply access and utilize the software without the need for detailed explanations because of the simple and intuitive interface design. Young users can comprehend and explore the functionalities independently with the support of clear visual cues and consistent design components.
- **Immediate and Clear Feedback:** When children are given prompt feedback, like red crosses and green check-marks for block placement, they pick up the proper actions and comprehension more rapidly. They need this immediate feedback loop to stay engaged and to develop self-confidence in their skills.
- **Encourages Exploration and Creativity:** Through experimentation with various blocks and settings, the software fosters children's creativity and curiosity. Infinite musical opportunities are made possible by the ability to combine different instruments and effects, which keeps the experience engaging and new.

- **Educational and Fun:** The software tries to strike a balance between learning and enjoyment by fusing interactive entertainment with educational content. In addition to learning about music and sound, kids also get fun experience in problem-solving and creative thinking.

In conclusion, an awareness of the target age group and a careful application of Don Norman's design principles produce an engaging user experience.

5.6 First Usability test

The first usability test revealed a number of interesting things about user behavior and perspectives. The Drum Block (Red Block) and Instrument Block (Yellow Block) were typically recognized by participants as a drum and a piano instead of an instrument block, respectively. However, there was considerable misunderstanding regarding the blue block, since answers ranged from a particular note to volume control.

While some participants had problems with block visibility, instrument changes, and sound levels, most participants had no trouble setting up or using the blocks. Requests for more user-friendly controls, like speed and volume sliders, as well as more precise descriptions of the purposes of the selected blocks, were persistent. Additionally, they expressed confusion about the reset button, suggesting it needs to be more prominent and clearly labeled. Participants recommended improvements such as adding settings for speed and volume, improving the readability of the text, and guaranteeing instantaneous feedback while using the blocks. Overall, while the fundamental features were easily grasped and utilized without any significant problems, more work is required to improve the user experience and clarity. (See appendix: A.16 for full observations)

5.7 Final iteration

Based on the usability test performed, (See section: 4.2) a second iteration of the product design has been chosen to be made with the improvements gathered from both observations and the feedback the participants gave from a think-aloud.

5.7.1 Information Architecture Diagram

To get an overview of how the interface is structured, an Information Architecture Diagram have chosen to be made.

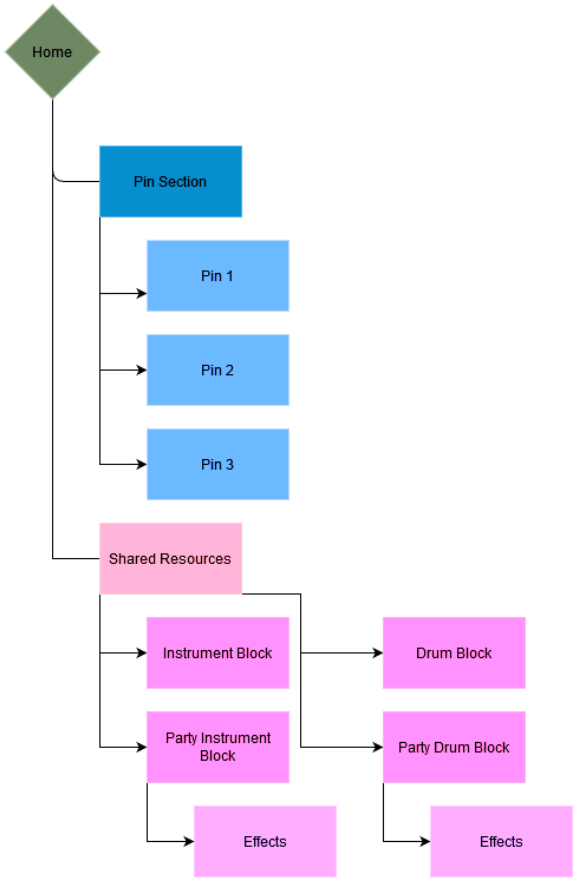


Figure 23: Information Architecture of the BlockBand interface

A summary of the interface structure and how its different parts interact is given in this diagram. The Home, the user's primary dashboard, is where things begin. Pin1, Pin2, or Pin3, which stand for particular block entry points. These choices result in Shared Resources, which are a centralized store of features that are available to various modules. The diagram is further decomposed into the individual blocks, each of which is in charge of managing a distinct musical element and user interaction. The Party Blocks also include subcomponents known as effects, which represent the effect menu. The diagram's arrows highlight the organization and usability of the system's interface by illuminating the logical progression from the Home through distinct sections and blocks. The information architecture diagram offers a clear map of the system's structure.

5.7.2 User OnBoarding

Based on the feedback about from the first usability test done, a starting guide was chosen to be made. This is because there were a general confusion about how each different block operate, after being asked the following question:

"*Find out what the three differently colored blocks do*". (See appendix: A.10)

It could be seen that none of the participants could identify the effect block, where some thought it was volume, specific music note or other form of sound creation. Full observation note and the tasks in the appendix (See Appendix: A.10). The guide chosen to be made, is inspired by the guides that LEGO sets usually come with, being a physical paper manual. This was chosen with the target group in mind, and was picked over other form of media like or video or digital tutorial because of its simplicity and link to the physical world that the user have to engage in. At the same time, Lego is popular enough that it can be argued that kids have tried to follow a Lego manual at least once, which makes the familiarity bigger between the target group and manual.

A physical manual also have the benefit of being accessible at all times, while using the product, and the user can reassure points of confusion. Here's how the manual looks:

Figure 24: Front Page: Welcome

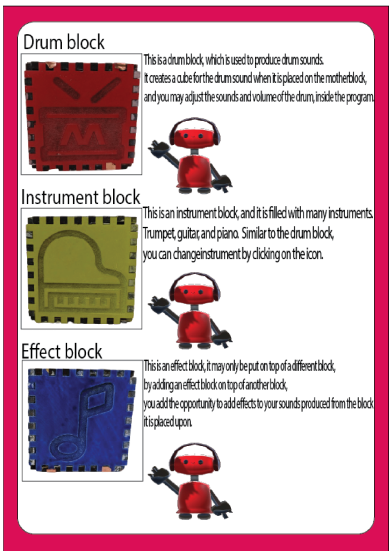


Figure 25: First Page: introduction of the different blocks

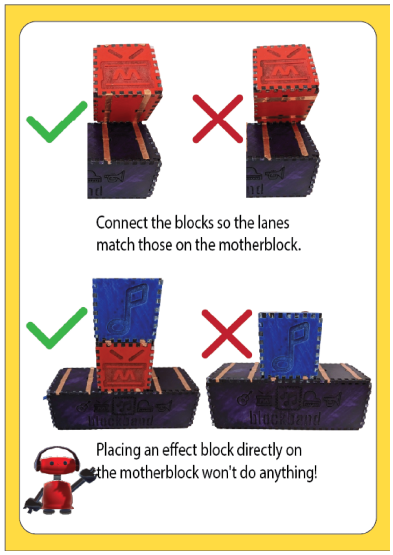


Figure 26: Second Page: placement of blocks

Figure 27: Last Page: mother-block and connection

Figure 28: The User Manual

The user manual in full size is found in appendix A.9

As well as the physical user manual, a small guide and information buttons, was also placed inside the program to help guide the user for quicker information, without having to look back on the guide. The guide has a slider that illustrates where to put blocks and allows you to click them for additional details, while the info button shows what the different functions

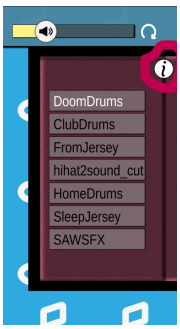
inside of it are (See figures: 29a & 29b).

5.7.3 Digital changes

In addition to a physical manual, some digital changes and improvements were also made after the first usability test. Most notably, a way to see if the physical blocks are establishing a connection to the program, and information options inside the program.

Check-marks beneath the mother-block platform in the user interface, is displaying a green check mark if a block was registered and a red cross if it is not registering. When a block was placed, it could see if the connection was established. This was included since the test participants found it difficult to determine whether the block was placed appropriately, while waiting for them to show up. (See figure:18c)

(a) The info page, inside the software.



(b) The info button highlights where to press for information about the different options in the block.

Figure 29: The information tools inside the software

5.7.4 UI Tweaks

In addition to the main changes made in the final design, some minor UI Tweaks were also made, being:

- The program's lighting was changed to make it brighter and more inviting in an effort to make the system seem more appealing to users.
- It was decided to include a background to the top bar where users adjust the pitch and volume.
- The initial information inside the program was moved into an open and closing option.

- The volume and pitch sliders provide a reset to default button.
- Numeration indicators of the sliders for clarity.
- A sound visualizer was added inside the block page, to show the sound waves

As well as to make it easier to See how to switch instruments, an indicator was added. The earlier form of right-clicking the block was removed as it confused the test participants when accidentally right-clicking. (See figures: 30a & 30b)

(a) Piano (b) Trumpet

Figure 30: Inside the instrument block, two different instruments, indicated by the carousel slider

5.7.5 Brand Identity

Many companies use mascots as a way of grabbing the attention of their target audience, as well as acting as the visual identity of the company [R. Lin, P. Lin, and Ko 1999]. For example, a known mascot in Denmark is the Oister's phone company, which have a purple oyster clam as a mascot. Similarly, Lego Mindstorm has established a brand identity with their robot model EV3RSTORM, which appears in numerous marketing materials for their kits, showcasing the capabilities of the product. In our product, we use a mascot called KVN (pronounced Kevin) (See figure 31). Named after famous American composer Kevin MacLeod, fitting the musical theme of the application.

Figure 31: Robot model KVN dances in response to the placed blocks

With the target audience being middle-school students, we thought it would be a good idea to have a friendly character that would explain how the product works. The robot was both implemented in the newly implemented manual and in the software, based on how many blocks placed upon the mother-block, Kvn would go from idle, dancing, break dancing. This was done to make Kvn more interactive with the user, and making the mascot more alive.

6 Implementation

This section provides an overview of the implementation details of the project. It outlines the process of implementation of the different components that make up the system, including the electrical circuit, block creation, Unity and its cooperation with both Arduino and pure-data. There are dependencies that have been used that include: Ardity [*Ardity* 2024] and Lib Pd [*libPd* 2024]

6.1 Hardware : Block Creation

The block creation has been done with the use of laser cutting, where multiple iterations of prototypes have been tested. The way as blocks are getting assembled is through the use of a joinery process, therefore there would be no use of nails or screws but rather the use of tension of the surface area.

6.1.1 The Electronic circuits

For the implementation, we used TinkerCAD to create a mock-up of how the electronics inside the blocks would interface with Arduino before developing a circuit diagram. The fundamental idea for identifying individual blocks within the same circuit is to utilize resistors in parallel. This method is used because resistors are passive electrical components, and the simplest way to achieve the desired results. The value of different resistors dictates how much the current will drop when a voltage is applied across various blocks.

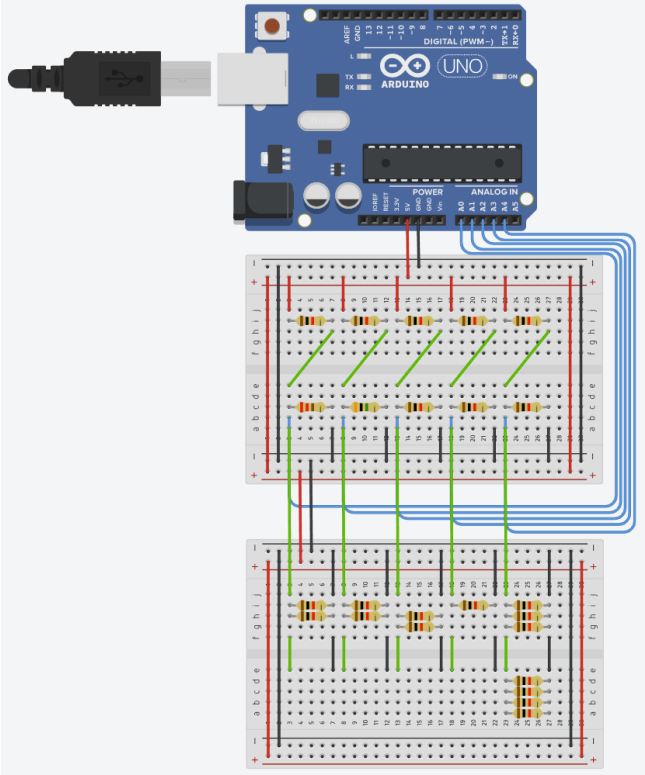


Figure 32: The mock-up Arduino circuit made inside TinkerCAD

Other concepts were discussed for how the blocks could be made, including RFID, a color identification sensor, and block image processing. The circuit would work as followed: the main platform block would house the Arduino and the voltage divider, allowing the Arduino to compare the resistance blocks being added while remaining a full circuit. The reason RFID and other forms of identifying the blocks are not used is because it would require each block to have its own sensor or embedded boards, which would be too expensive, and the individual blocks would need their own code, etc. So by housing the Arduino and voltage divider inside the main block was the most accessible solution.

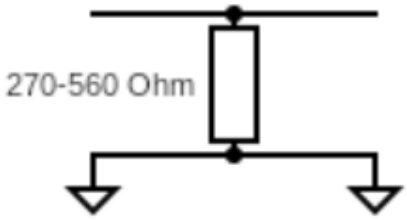
Each voltage divider would be placed into one of the Arduino's analog pins. The blocks are technically just resistors with two ends coming off of them. They work by having the resistance in parallel with the ground-end resistor in the voltage-divider circuit. The resistors in the blocks would influence the values being read by Arduino, because of the resistors in parallel property, which can be calculated using the following formula;

$$\frac{1}{R_{tot}} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_n} \tag{1}$$

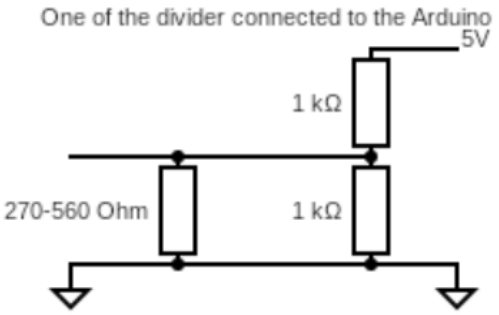
For the first iteration of the blocks, these were the resister values used to identify them:

Instrument Block	Drum Block	Effect Block
560Ω resistor	330Ω resistor	270Ω resistor

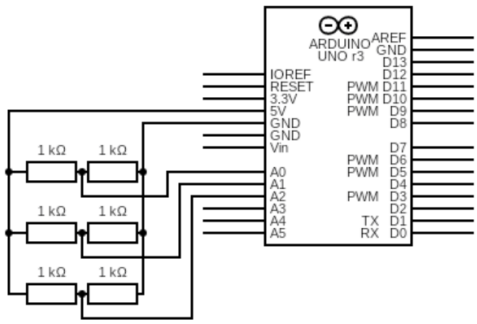
Table 1: The different resistors value for each block



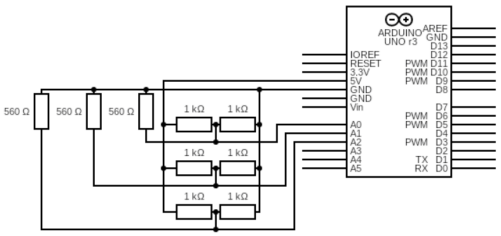
(a) A simple diagram representing the small block circuit



(b) Image showing connection between the small blocks to one of the voltage dividers in the main block



(c) Circuit diagram of the main block, containing 3 voltage dividers connecting to 3 analog pins on the Arduino board



(d) A circuit diagram simulating the user putting 3 of the same blocks on the first row

Figure 33: Electronic circuit diagram of different stages and connections

By having two ends, the blocks could be stacked on top of each other infinitely. We came across a problem with the connection being unstable, and because the values being read sometimes get too close to each other on different blocks, Unity would think a different block wad read. From this we decided to increase the distance of the values between the blocks but noticed that when we put two blocks together, e.g. putting an effect block on to an instrument block, the effect block would affect the value differently. To solve this issue, the effect block has a secondary resistor, and it will only connect to a specific block and only the

primary resistor would affect all types of blocks.

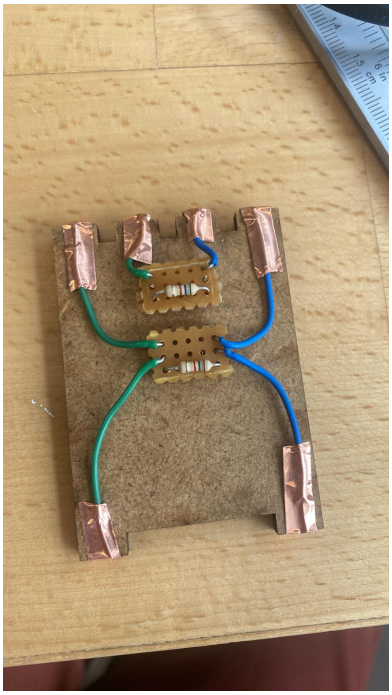


Figure 34: The circuit board of the effect block, inner resistor is the secondary resistor

The block that would be affected by the secondary resistor gets the changes where it would have 3 pairs of wires instead of 2 pairs, where one of the pair would connect to the secondary resistor and the 2 other pairs function the exact same way as the rest.

The electronic components that were used to make the circuits were only made up of resistors and wires, the different resistance values in the second iteration and final version of the blocks were:

Voltage dividers	Instrument Block	Drum Block	Effect Block
1kΩ resistor	3.9kΩ resistor	490Ω resistor (390Ω+100Ω)	1.5k Ω resistors & 560 Ω resistor

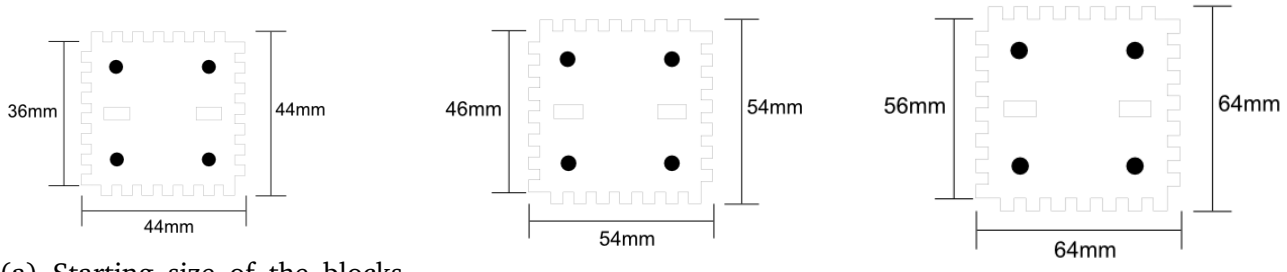
Table 2: The different resistors value for each block

6.1.2 Crafting the blocks

Like mentioned in the text above, while finding the correct size, it when through different early iteration. Two iterations of block-size were tried before getting the right size. The

different measurements it went through until finding the correct size was for the mother-block 56mm x 183.4mm and for the blocks 56mm x 56mm. The iterations of the block size are found in appendix. (See Appendix: A.23)

Originally the blocks were meant to seat magnets with an engraving but after testing, it was found out that the magnets weren't strong enough to give feedback that we wanted. The engraving were then instead drilled and laser cut all the way through, This made the effect of the magnets stronger since it has no travel distance compare to 4mm before drilling. To guarantee that the blocks could join the circuit, the connecting holes in the top section were included in the design from the beginning, where the copper tape would get feed through the holes making it possible for the blocks to make contact. The figure beneath (figure: 35) shows the measurement of the block's edges length.



(a) Starting size of the blocks, usable size of 36mmx36mm

(b) block size increased by 10mm

(c) The final size of the small blocks

Figure 35: The small blocks size iteration (not to scale)

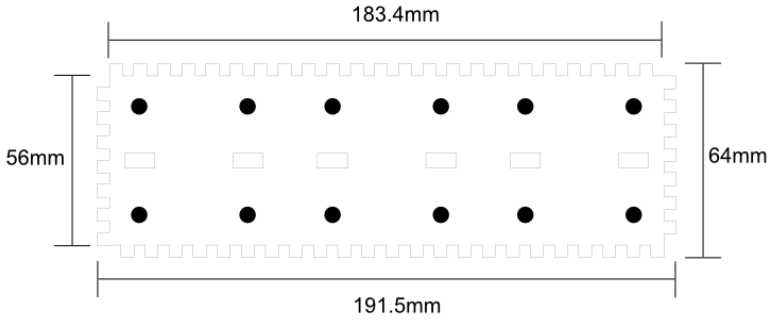


Figure 36: The final size of the mother block (not to scale)

The middle part, which can be seen in figure: (See Figure: 34) was made after the final size of the blocks were decided, where the measurements were taken directly from the blocks. With the max length of 56mm and removing the middle section by the material thickness

(4mm) on each side, the size and the distance of the holes were then measured but with 1mm smaller width than the actual holes size in order for it to fit easier and ensuring the copper tape does not get teared up in the process of putting the part into the blocks.

6.1.3 Assembly

The blocks were laser cut using the files above (See figure:36 & 35) and some other files in a DXF format, which is a type of vector format. The material used were 4mm thick MDF boards. After the parts were cut, we then glue on the magnets with the correct polarity where all the bottom face and the top face would all have a corresponding polarity. The blocks were then painted with a primer and acrylic paint, afterward the circuits were then placed on the circuit holder as shown in figure:34 with the mother block having 3 circuit holders and an Arduino with a cable coming out off one of the side. Everything were then assembled but as the blocks were tight with just friction fitting alone, no further gluing were needed.

6.2 External integration

6.2.1 Pure Data to Unity : Early iterative stage

To obtain a wider understanding of what sounds to make, and to experiment with creating some of the sound would be used in the product, Pure Data (Pd) have been used to create some musical pieces. Pd is a node-based programming language, designed to create multi-media elements. Creating the sounds from scratch in Pd made the understanding of what elements makes and contribute to the sound greater, and from there be able to narrow in on what types of sounds, that the digital side is going to contain. It was mainly in the drum-block that sound were created to, because instruments like bass, hi-hat or snare were the least complex to sketch.

The way it has been made is though the use of various nodes that together create the intended sound. The explanation of the process of the creation of a bass sound can be found in appendix (A.22). Other sounds have been created with different components, the same course of action is the same for each sound.

All of this was used as a preliminary testing product to See if Unity and PureData could work together, before the boxes and the real sounds were implemented.

6.2.2 Sound implementation

Pure data contributed to our understanding of sound and sound processing, However it was not employed in our final implementation. The sounds, in our final implementation, are a blend of self-made sound loops and sampled audio. Many of the sound bytes were made using FL Studio and its built-in tools. From the sampled audio, it was gathered from the website SampleFocus.com, it got a royalty free license, under Standard License. From their own Frequently asked question (FAQ) this is what's written about using the sounds uploaded to their sound.

What rights do I have for samples I download from this service?

"*You may remix, transform, and build upon the material for any purpose, even commercially. All sounds on Sample Focus are licensed under our Standard License.*

This means that all sounds are royalty free and no attribution is required!" (See appendix: A.21)

Some of these sounds, sampled, have later been edited and modified to fit the general theme better.

6.2.3 Arduino to Unity

For the interaction between the physical blocks and the software part, an Arduino has been used as the intermediary, where a Unity package called Ardity is used to establish the connection to the Unity project. The script for handling and processing of the block data gathered from the Arduino pins is run through its own Arduino IDE, and is then the information that would be printed out in the Arduino IDE originally, is instead sent to the Unity console instead, via the Ardity package.

In Unity, the data sent to the console is then needed to be captured and transformed into its intended purpose. A script has been made to handle and extract the specific log message and convert it to a value. First, it uses the 'Application.logMessageReceived' in the void OnEnable() so each time a log message is received, it calls the Log() function. The Log function takes these three parameters

- logString (string) which is the log message itself
- stackTrace (string) which is information about if some errors occur in the log message

- type (LogType) which is which type of log message that was generated, such as normal, warning or error.

Inside the Log function it then checks for the log message if it starts with the specific string, if true then it proceeds to split the message into three parts, and if that works, it sets the third part as a float value. Lastly, updating the UpdateText() function with the new float value, being the sensor value.

```
public void Log(string logString, string stackTrace, LogType type)
{
    // Check if the log string starts with "Message arrived: R1"
    if (logString.StartsWith("Message arrived: R1"))
    {
        // Split the log string
        string[] parts = logString.Split(':');

        if (parts.Length == 3)
        {
            float value;
            if (float.TryParse(parts[2].Trim(), out value))
            {
                UpdateText(valueText, value);
            }
        }
    }
}
```

Figure 37: Code for reading the console and parsing as a float value)

Each pin's state is updated by the valuereader2 script, which also ascertains the pin's present state from the sensor data. It makes the right block type recognized and updated appropriately. In order to check the block type, the script additionally has logic to stabilize the connection by requiring the sensor value to stay within a particular range for a predetermined amount of time. By doing this, temporary variations in the sensor data are less likely to result in inaccurate readings:

```
void UpdatePinState([...])
{
    [...]
        // Display "Pending" if not stabilized and pin value is not 510
        if (currentStateDuration < stateStableDuration && pinValue !=510f)
        {
        valueText.text = "Pending";
        }
        else
        {
        // Assign and display the state based on specific value ranges
        if (pinValue >= drumRangeLower && pinValue <= drumRangeUpper)
        {
        currentPinState = targetState; // Drum
        }
        else if (pinValue >= instrumentRangeLower && pinValue <= instrumentRangeUpper)
        {
        currentPinState = targetState + 1; // Instrument
        }
        else if (pinValue >= partyDrumRangeLower && pinValue <= partyDrumRangeUpper)
        {
        currentPinState = targetState + 2; // Party Drum
        }
        else if (pinValue >= partyInstrumentRangeLower && pinValue <=
        ↪  partyInstrumentRangeUpper)
        {
        currentPinState = targetState + 3; // Party Instrument
        }
        valueText.text = currentPinState.ToString();
    }
    [...]
}
```

Figure 38: If-statement inside UpdatePinState() that takes the pin values and given parameters, and updates the UI accordingly)

6.3 Software : Block spawn

As mentioned in section 6.2.3, the block spawning process is a critical component of the system, allowing the correct blocks to be displayed and interacted with based on sensor input. The process begins with the Arduino reading sensor data, which identifies blocks through their unique resistor values. This data is then sent to Unity using the Ardity package, facilitating seamless communication between the Arduino and Unity. Within Unity, a custom script processes the log messages received from the Arduino, parsing sensor values to determine the active block type. The ConsoleReader script exemplifies this data processing (See code: 37).

The 'CubeSpawn' script is where we show the active cubes and hide inactive ones. There are 3 instances with this script, one for each pin. The script loops through a list of Game object instances and if the index matches the parsed integer value, the corresponding cube and all of its components (Audiosource, MeshRenderer, Colliders) will show and activated. This list contains various blocks, such as the Drum-block and the instrument-block, This logic is executed in the 'Update' method, a method that is called every frame. So every frame we check if an integer value equals a value on the list and updates the active cube accordingly.

```
1  public void SpawnCube()
2  {
3      // Loop through all cube combinations
4      for (int i = 0; i < cubeCombinations.Length; i++)
5      {
6          // Get the cube combination at the current index
7          GameObject combination = cubeCombinations[i];
8
9          // if i matches the index activate the combination.
10         SetCubeCombinationActive(combination, i == integerValue);
11     }
12 }
```

Figure 39: SpawnCube() method that iterates through a list and activates the block at the current index if it matches the specified integer value.

Before putting the blocks in the Cubespawn list, we categorize each block in the unity inspector using enumerators. The enumerator categorizes the blocks into 4 types are Drums (Drum block), MIDI (Instrument Block), PartyDrums(Drum Block with effects) and PartyMIDI (Instrument block with effects). Home to the enumerator can be found in the 'BlockManager' script. The 'BlockManager' script is also home to many other attributes for each individual block. These attributes are assigned at the start of the application.

```
1  public class BlockManager : MonoBehaviour
2  {
3      //TYPES OF BLOCKS
4      public enum BlockType
5      {
6          Drums,
7          MIDI,
8          PartyDrums,
9          PartyMIDI
10     }
11     [...]
12 }
```

Figure 40: Enum categorization for the types of blocks in the BlockManager class.

In the Start method of the Clicker script, a switch statement assigns the correct attributes to each block based on its enumerator. For example, if a block is of drum type, the script populates its empty sound list with drum sounds from the 'BlockManager'. This logic repeats for each attribute and applies similarly to other block types. The same goes for the interface; for each block is an interface instantiated that matches the type of the block. Clicking a block will show its interface.

```
public class Clicker : MonoBehaviour, IClickable
{
    [...]
        //ADDS CORRECT RANGE OF SOUNDS TO THE LIST OF SOUNDS
        //INSTANTIATES CORRECT BUTTONS BASED ON TYPE OF BLOCK
        //ASSIGNS THIS BLOCK AS TO THE INTERFACE PROPERTIES
       switch (blockType)
        {
            case BlockManager.BlockType.Drums:
                changeButton = blockManager.switchButtons;
                blockSounds.AddRange(blockManager.drumLoops);
                interfaceInstance = Instantiate(blockManager.drum_Interface,
                ↪  interfaceCanvas.transform);
                interfaceInstance.GetComponent<EffectHandler>().myBlock = gameObject;
                soundContainer = interfaceInstance.transform.Find("Sounds_Container");
                soundContainer.GetComponent<UpdateSounds>().thyBlock = gameObject;
                SetupButtons(blockSounds, changeButton, interfaceInstance,
                ↪  soundContainer);

                break;

            [...]
        }
    [...]
}
```

Figure 41: How properties are assigned to blocks of type drum (Case repeats for other types of blocks)

6.3.1 Digital interface

Each individual block has an icon, volume and pitch sliders, and a list of sounds on its interface. Buttons are used to represent the list of sounds. We can easily set the buttons to call the methods of our choice by utilizing Unity's built-in AddListener function. These buttons, when pressed, swap out the audio clip presently playing with the button's corresponding audio clip.

You can click the icon to alter the sounds in the instrument block's list. Clicking the icon, for

instance, will remove any piano sounds that are currently in the list and replace them with the sounds of the next instrument in line. The instrument block contains three instruments, which are arranged as follows: piano, guitar, and trumpet.

A drum-block or an instrument-block can become party blocks, which enable the application of audio effects, by placing an effect block on top of them. By selecting the button on the far-right, the user can access the effect page. This page has sliders to control the delay and distortion, as well as presets for two different types of reverb. This functionality is made possible via Unity's audio processing facilities, which offer programmable filter elements.

For instance, the distortion level in the EffectHandler script is adjusted to correspond with the value selected on the distortion slider. The altered audio signal sounds more forceful due to distortion, which is a harmonically saturated sound that is most audible when the slider is set to its highest value. By repeating the audio stream after a predetermined amount of time, delay produces an echo-like effect. We use the echo filter component in Unity to accomplish this. The delay slider modifies the echo filter's wet mix value appropriately. Additionally, Unity provides a range of named reverb presets that mimic various acoustic settings. We set up two presets for each button, one with the 'Underwater' preset and the other with the 'Psychotic' preset, using the AddListener function.

The Unity UI is used by the digital interface, to create the space for user interaction. Unity has incorporated some common DAW elements to the digital interface, including as pitch and volume controls, as well as the Play and Pause buttons. An audio manager script detects all the AudioSources in the scene first so that all the components can be managed at the same time. For every component, public methods are made, with a for each function that iterates through all the sources and applies the pertinent modifications. Buttons are used to operate the play and pause features, while sliders regulate the volume and pitch.

```
1 private AudioSource[] audioSource;
2 public Slider volumeSlider;
3 public Slider frequencySlider;
4
5 void Start()
6 {
7     audioSource = FindObjectsOfType<AudioSource>();
8     frequencySlider.onValueChanged.AddListener(FrequencyChange);
```

```
}

public void Pause()
{
    foreach (AudioSource source in audioSource)
    {
        source.Pause();
    }
}
```

6.4 2. Iteration

6.4.1 Changes to existing parts:

ValueReader

With the better connections, through the improved resistors value, the script was changed to match the new parameter, and make the code more simple

Structural Changes: A class definition called ValueReader4 has been added in the latest version. To improve readability and manageability, the variables like current and last pin states are now specified at the class level.

```
using UnityEngine;
using TMPro;

public class ValueReader4 : MonoBehaviour
{
    public TextMeshProUGUI Pin1, Pin2, Pin3;
    public TextMeshProUGUI value1, value2, value3;

    private int currentPin1State, currentPin2State, currentPin3State;
    private float lastPin1Value, lastPin2Value, lastPin3Value;
    private float currentStateDuration1 = 0f, currentStateDuration2 = 0f,
    ↪  currentStateDuration3 = 0f;

    private const float stateStableDuration = 2f; // Time before considering the state as
    ↪  stable
```

```
14      private const float blockChangeDelay = 2f; // Unused, needed if blocks parameter
        ↪  starts getting unstable
15
16      // Value ranges for different musical blocks
17      private readonly int drumRangeLower = 200, drumRangeUpper = 300;
18      private readonly int instrumentRangeLower = 400, instrumentRangeUpper = 500;
19      private readonly int partyDrumRangeLower = 100, partyDrumRangeUpper = 200;
20      private readonly int partyInstrumentRangeLower = 300, partyInstrumentRangeUpper = 400;
21  }
```

Because stateStableDuration and blockChangeDelay are declared at the class level, it is simpler to read and modify these values. Value ranges are now designated as read-only fields for certain musical blocks. This makes the value ranges easier to update.

Method Changes: The Update method has been made simpler by passing UpdatePinState with fewer parameters. This cut removes duplication and improves the understandability of method calls.

```
1   void Update()
2   {
3       UpdatePinState(ref currentStateDuration1, ref lastPin1Value, ref currentPin1State,
        ↪  Pin1, ref value1, 2);
4       UpdatePinState(ref currentStateDuration2, ref lastPin2Value, ref currentPin2State,
        ↪  Pin2, ref value2, 2);
5       UpdatePinState(ref currentStateDuration3, ref lastPin3Value, ref currentPin3State,
        ↪  Pin3, ref value3, 2);
6   }
```

UpdatePinState's method signature has been made simpler by eliminating the parameters for value ranges, which are now class-level fields. Now that only the required parameters are accepted, the method's functionality is more streamlined.

The new version explicitly sets the valueText to "Pending" if the pin value is not stable and not equal to 510, and resets currentStateDuration to '0f'. This change provides clearer feedback to the UI regarding the pin state during stabilization. The logic for assigning currentPin-

State based on the pin value range has been refactored for readability. The state is set to targetState, targetState + 1, targetState + 2, or targetState + 3 based on the pin value's range.

6.4.2 New parts added

Audio visualizer To have a visual component in the program, an audio visualizer has been made, this is a simple audio visualizer that responds to the sound being played

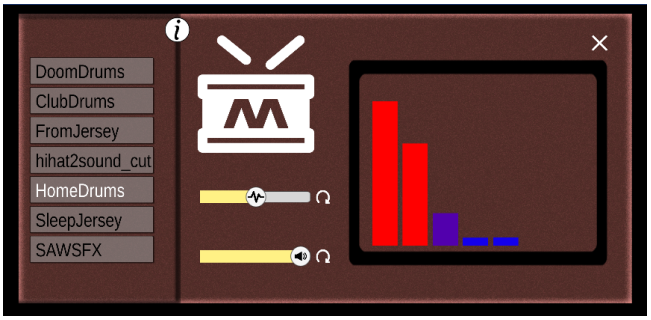


Figure 42: Showcase of Audio Visualizer

The way it's illustrated is simply by having 5 white images, repressing bars, beside each other, that gets scaled. The way that the bars move is though analyzing the audio input's frequency spectrum using a Fast Fourier Transform (FFT). The FFT is an algorithm that transfer the signal from its time domain into its frequency domain, and then filling a spectrum with the frequencies, that in turn visualize it as bars.

```
void Start(){
    spectrumData = new float[numberOfSamples];
    visualizerScales = new float[visualizerBars.Length];
    SetVisualizerPositions();
}

public void spectrumLaviosa(AudioSource audioSource){
    // Get spectrum data from audio source
    audioSource.GetSpectrumData(spectrumData, 0, FFTWindow.BlackmanHarris);

    // Update visualizer bars
    for (int i = 0; i < visualizerBars.Length; i++)
    {
        float intensity = spectrumData[i];
        visualizerScales[i] = Mathf.Lerp(visualizerScales[i], intensity * maxScale,
        ↪  Time.deltaTime * lerpSpeed);
    }
}
```

Figure 43: In the Visulizer class, arrays are utilized to update and lerp are range of bars based on audio spectrum data

In this snippet the Start() function initialize the spectrumData, that is the array to store the results from FFT, that is amplitude of the different frequencies. visualizerScales is the scale of the bars, lastly the position gets sets as well. In the function spectrumLaviosa the spectrumData gets filled by the GetSpectrumData method, and then loops over the bars and represent the intensity of them with this amplitude.

For the actual scaling and changing, the color of the bars is looped over, and changed depending on the spectrum data.

Check-Mark function

The script is initialized, attached to the pin GameObjects in the Unity Editor, and then it waits for certain events caused by block interactions. Every log message is analyzed using the logMessageReceived method in OnEnable() to determine if it represents a successful action that should result in the visual signal changing from a red cross to a check mark. If the log

message has the proper structure, it is segmented into parts so that the necessary information may be extracted. The script adjusts the check-mark by using this data to identify which UI element matches the block placement.

```
1    void Update()
2    {
3        // INT VALUE TO BE PARSED
4        int textValue;
5
6        if (int.TryParse(PinText.text, out textValue))
7        {
8            // SHOW WRONGIMAGE IF TEXTVALUE IS DEFAULT VALUE
9            if (textValue == 510  textValue == 0)
10           {
11               //SET IMAGE TO WRONGE IMAGE
12               targetImage.sprite = wrongImage;
13           }
14           else
15           {
16               //SET IMAGE TO RIGHT IMAGE
17               targetImage.sprite = rightImage;
18           }
19       }
20   }
```

Figure 44: In 'Update()' of ImageSwitcher, a checkmark is shown when the pin is not resting at a default value

6.5 UML

The system's flow and interaction are depicted in the following UML diagrams, which also show how different parts cooperate to control block placements, user interactions, and visual feedback.

6.5.1 Sequence Diagram

This flowchart illustrates the steps involved in placing and then removing a block by the user. The sensor value is communicated to the Arduino when a block is put, and the Arduino uses the SerialController to connect to the Unity terminal. When the MessageListener processes a message, the ConsoleReader and ValueReader are notified, which causes the CubeSpawn component to update and either initialize or destroy the cube.

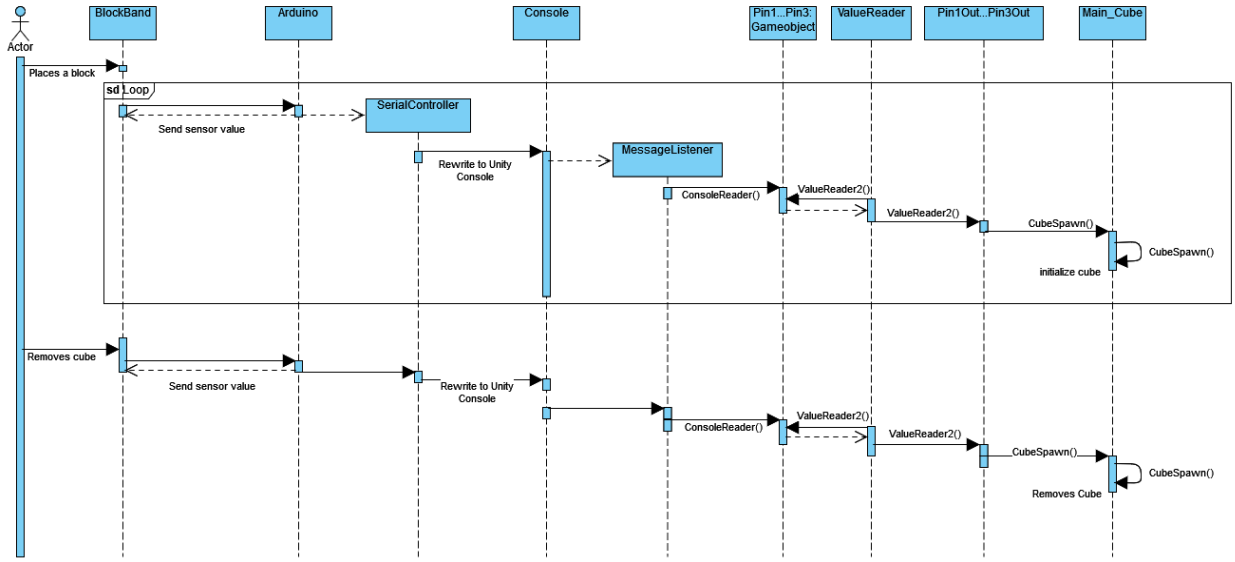


Figure 45: Sequence diagram of program

6.5.2 Activity Diagram

This activity diagram outlines the steps taken when a user changes the instrument. When the user clicks to change the instrument, the effectHandler processes the request, the Block-Manager updates the instrument, and the UI reflects this change. This ensures that user interactions result in immediate and clear visual feedback.

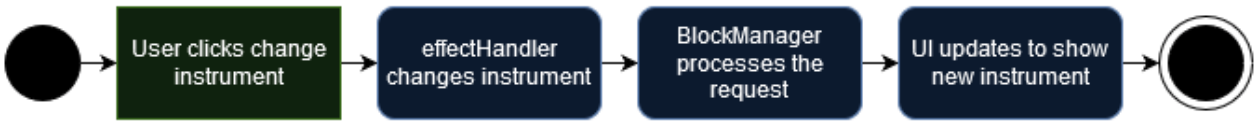


Figure 46: Activity diagram after user interaction

6.5.3 Class Diagram

The diagram illustrates how each class's properties and methods relate to one another and how they cooperate to control the system's state and react to user input.

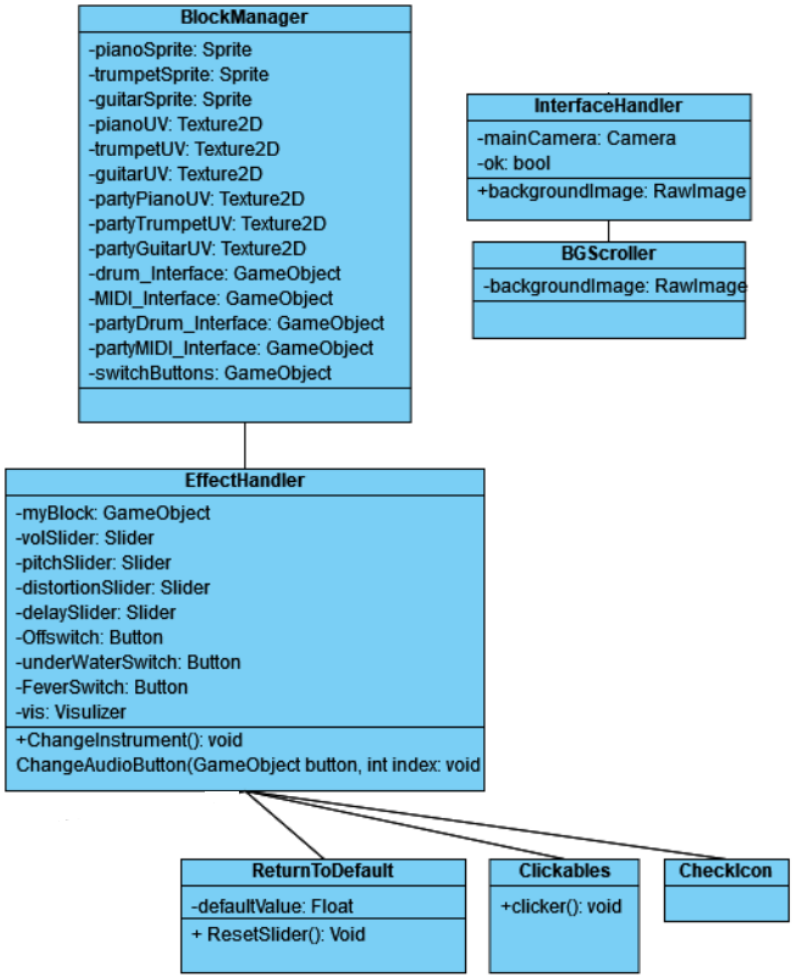


Figure 47: Class diagram of program

6.5.4 Component Diagram

The relationship between the SerialController and the voltage sensor (Voltage_res) is depicted in this component diagram. The serial communication is started by the Voltage_res component, which also periodically transmits data over serial that the SerialController reads and processes to update the system state.

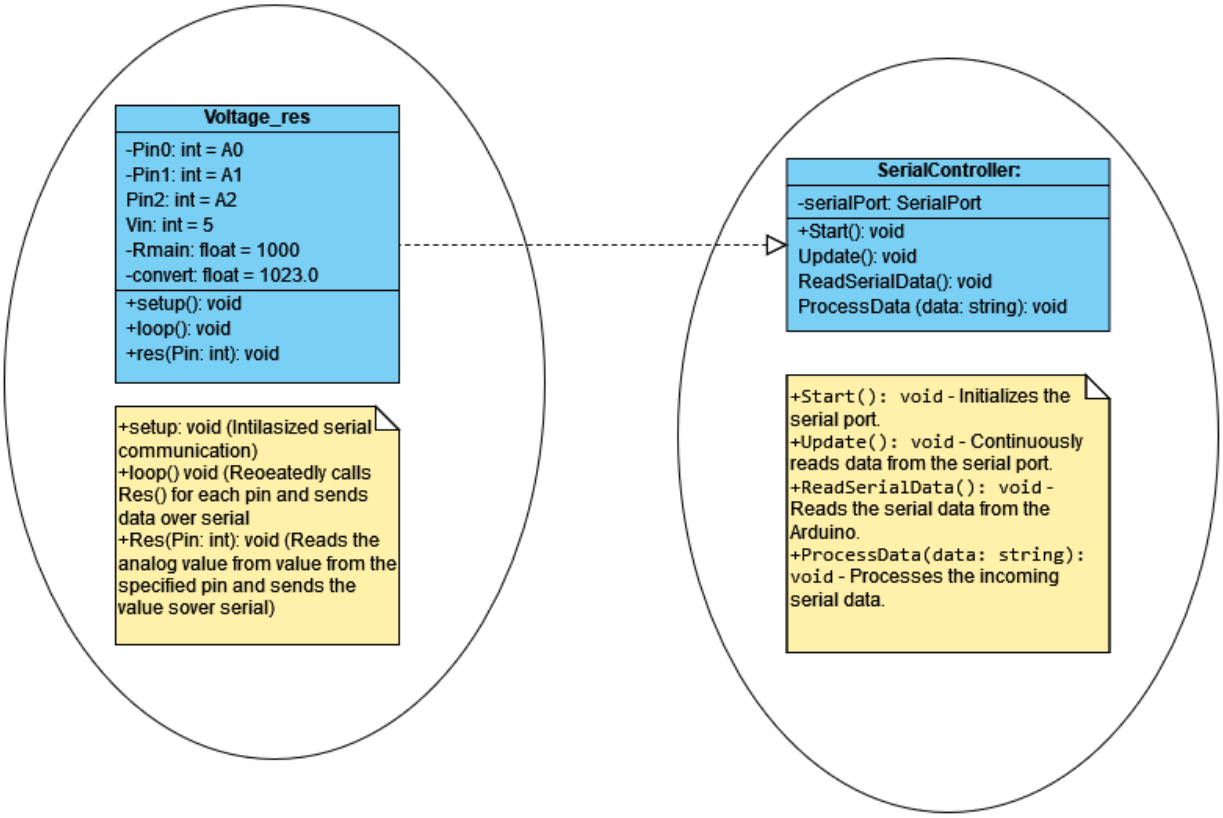


Figure 48: Component diagram between Arduino and the program

7 Evaluation

7.1 Motivation

The motivation for this project is to evaluate how the integration of a hands-on modular music block with an interactive, simple digital audio station influences engagement in musical exploration and experimentation. The goal was to determine if the integrated tools increases engagement and encourages children to experiment and learn. The initial target group was middle school children aged 912 years old. However, due to constraints, the test was conducted on university students. While this may introduce limitations, the findings provided useful insights into the potential impact of the products that this evaluation section aims to provide. The iterations of the product are separated into 2 iterations, the first iteration was the version where the usability test was conducted, and the second version was the version where the final test was conducted.

7.2 First Usability test

To evaluate the usability of the system, a usability test was conducted with a group of participants. The goal was to gather feedback and to identify areas for improvement. The System Usability scale (SUS) facilitated quantifying the results and usability of the system. From the first usability test done, a SUS score was gathered, and the results were as followed:

- Participant 1: 70
- Participant 2: 87.5
- Participant 3: 67.5
- Participant 4: 75
- Participant 5: 62.5

And the mean SUS score calculated from these results is 72.5:

$$(70 + 87.5 + 67.5 + 75 + 62.5)/5 = 72.5 \tag{2}$$

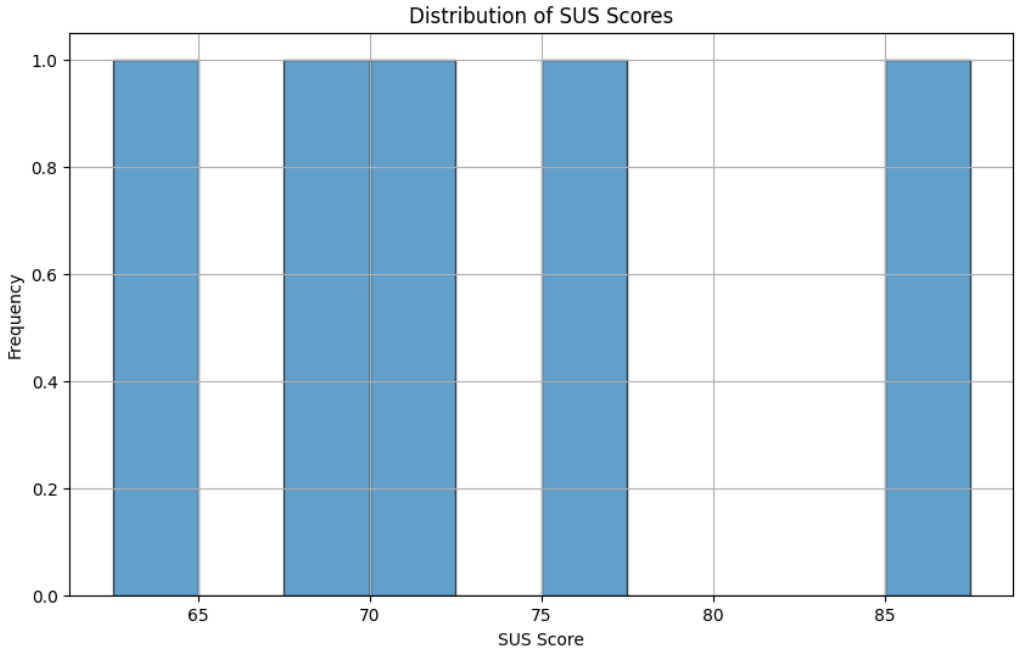


Figure 49: The SUS scores visualized

When evaluating the results from the tasks, interesting results can be seen. Already on task one, "Find out what the three differently colored blocks do," it was shown by the results that almost all participants (4/5) guessed the yellow instrument block was a piano block, not an instrument block. Same thing with the blue note block, as all 5 participants couldn't guess what the purpose of the block was. It was only the red one that people correctly guessed.

Another thing to be noted about the results of the observations is on task 5 "Change the instrument (block).". The test participants all had different ideas on what this meant and how to change an instrument. A more in depth guide would probably be needed to solve this issue in what the instrument really means to be changed and how. Additionally, participants experienced issues with the blocks not registering. No other significant issues were noted during the observations (See Appendix: A.16). The blocks not registering correctly was an important matter to address in order to maintain the reliability of our user engagement.

7.3 Precision testing

In the ongoing effort to ensure the reliability of the connection between the main-block and the parameter blocks, a precision test was done to test the consistency of the electrical signals generated. This was done because it directly impacts the performance of the whole system.

It is important to mention that this precision test was conducted on the first iteration of the blocks, and it was known before that they were not as stable as we wanted.

7.3.1 Test Setup

The test was done within the group, and the whole test was done in the same location to ensure environmental factors were minimal. The way the results were gathered was though Arduino's own console, where the values from the blocks were logged. The results were also gathered from the logs of the Unity Engine for comparison.

7.3.2 Methodology

The precision test was carried out by testing each block on each of the 3 locations on the main block, corresponding to each of the 3 pins of the Arduino. All the blocks were tested twice: once with no external pressure pushing them down onto the main-block, once with the use of a hand, and once without. The reason for the testing of the hand pressure is that, through our own debugging, it was discovered that pressing one's hand down on the block would create a stronger connection.

7.3.3 Results

There was precision testing in both iterations of the block designs, and it was done to test how the new design consistency was compared to the first version. In the test, there were 510 values that were highlighted, that is because the data-point is a non-registered reading. For dataset, this outlier had a overestimation of the analysis and is not a valid data points, and is therefore filtered out, to obtain a more accurate variability. The 510 value is considered, as a comparison of how many non-registered readings the testings have, and can be used to see the three different pins error rates.

7.3.4 Results from first precision test

The results that were gathered from the first precision test done, have been summarized, compared and visualized. Some interesting observations will be presented, while the raw data can be found in appendix (See Appendix: A.7.) There is a comparing of some of the results, (See appendix: A.24) Because the different blocks have different benchmarks, because of the inherent resisters values, the mean and median can not be compared across all

blocks, but the standard deviation (σ) can, this way it can tell about the difference in the two measuring places, being Arduino's own IDE, and in the Unity interface.

The way the combined standard deviation if calculated, is by getting the variance for each of the different dataset, that is from each of the blocks, and doing these steps:

- Time each variance by the number of data-points
- Sum them all together
- Combine them, by dividing them by the total number of data points
- Square-root it to get the standard deviation

The mean σ for the Arduino IDE

$$CombinedresultVARIENCE : 232.92 CombinedresultSTD : 15.26 \tag{3}$$

The mean σ for the Unity interface

$$CombinedresultVARIENCE : 189.05 CombinedresultSTD : 13.74 \tag{4}$$

This is with the values without 510, the non-registered in the calculation.

For readability, the parameters have been abbreviated and labeled. The labels meanings are as follows: Y1 is of the instrument-blocks, Y2 is another instrument-block, R is the drum-block, B is the effect-block.

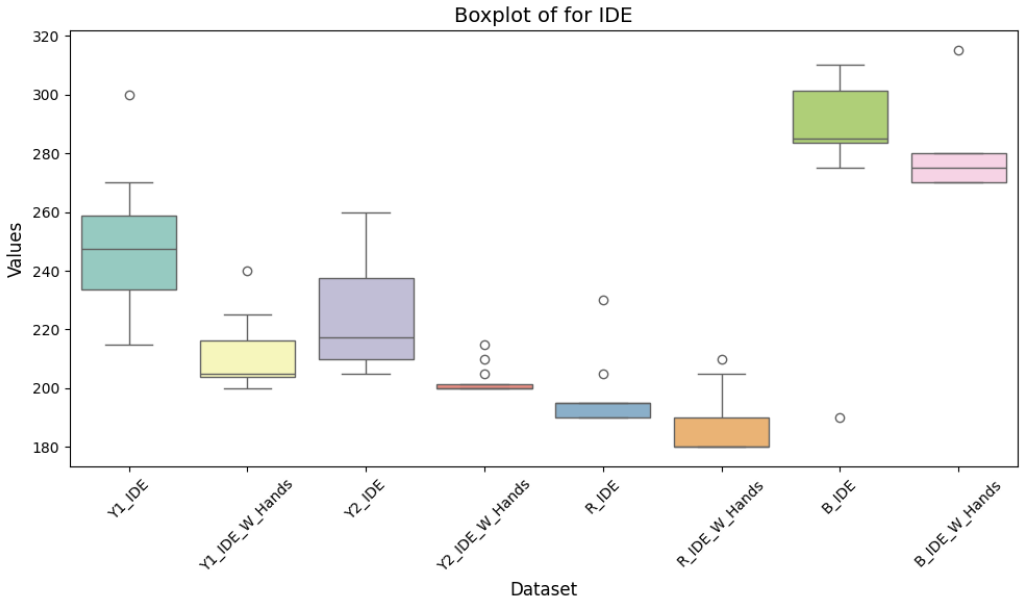


Figure 50: Box-plot of measurements taken from the Arduino IDE

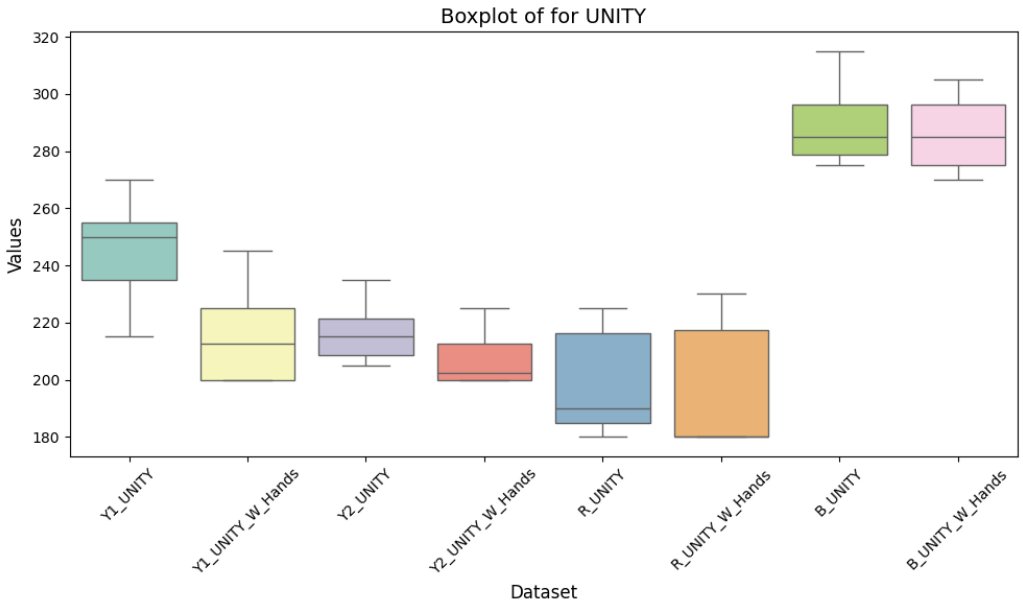


Figure 51: Box-plot of measurements taken from the Unity Interface

It can be observed that the use of hand pressure results in lower values in the box plot, suggesting a potentially stronger and more stable connection. It is also seen that the size of the interquartile range (IQR) for the IDE and UNITY measurements are different, both compared to each other, but also comparing their consistency in with and without hand pressure. In the UNITY measures, the size of the IQR for the different blocks are mostly consistence, meaning that the fluctuation is not as great as in the IDE. It can also be seen that

the precision of the IDE, meaning the size of the IQR, is smaller, especially when using hands pressure.

7.3.5 Results from second precision test

After the first usability was made, and in anticipation of the final test, a remake of the blocks internal circuits was made, this was done both to get a more stable connection and to spread out the sensor values read to a wider area, therefore less chance of two different blocks overlapping each other's value. The way that the testing of the second and final precision testing was done, were identical to the first one, with the use of the same setup and methodology, with the new additions being more blocks to test on. The same measurements as in the first precision testing would be measures, with the first one being the standard deviation(σ) of the different blocks. Because the goal of remaking the blocks were to get more stability in the connections, it should also be seen in the σ, that it is less.

The σ for the Arduino IDE

Combined result VARIENCE: 91.06
Combined result STD: 9.54

The σ for the Unity interface

Combined result VARIENCE: 204.05
Combined result STD: 14.28

It can be seen that for the both Arduino IDE and Unity, the σ is lower in the second test done, with scores being reduced by: 10.8 for the IDE and 7.4 for Unity.

When plotting the results in a box-plot, it becomes clearer how the data-points unfolds.

When comparing these box-plots to the ones made for the first test, it can be seen that the (IQR) for the measures are significantly smaller, and more consistence across different blocks. The pattern that was observed in the first test, where the use of hand pressure would lower the IQR, can not be seen here, showing that the blocks have gotten a more stable value read out. It can also be seen that across the same types of blocks, such as instruments blocks (Y1, Y2, and Y3) values remain similar, a pattern harder to see in the first test.

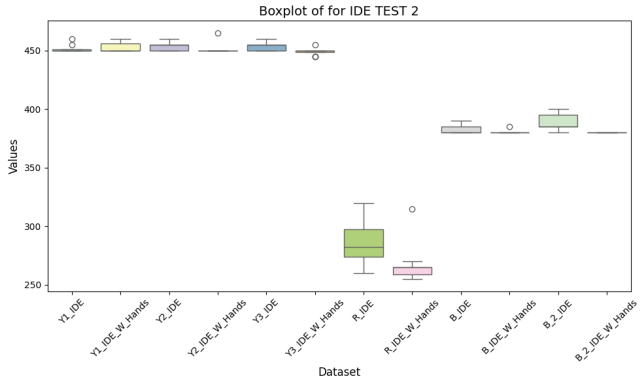


Figure 52: Box-plot for the measurements in the IDE in the second test

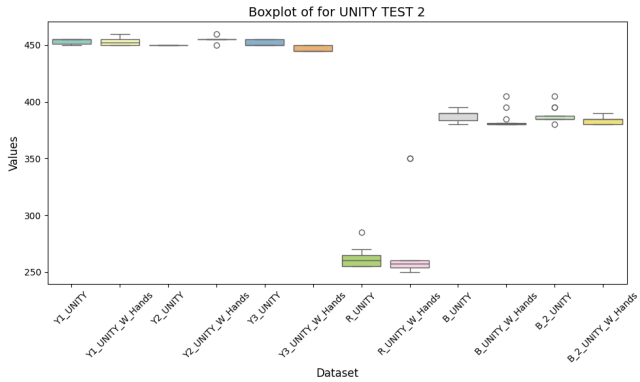


Figure 53: Box-plot for the measurements in the UNITY in the second test

7.3.6 Non-registered results

For the non-registered results, the data shows the detection percent for all three pins. The data was taken from the precision test mentioned above, and since the test was only done twice per combination, there are not many data points to get accurate results, but the purpose is mostly to get a rough idea of which pins and blocks have the worst detection problems.

IDE Detection Analysis					Detection/Pins
Total Detection	Y1 Dectection %	B Dectection %	Y1	B	87,50%
Pin 1	50,00%	100,00%	2	4	93,75%
Pin 2	50,00%	100,00%	2	4	100,00%
Pin 3	100,00%	100,00%	4	4	
	Y1 w/h Dectection %	B w/h Dectection %	Y1 w/ hand	B w/ hand	
Pin 1	100,00%	100,00%	4	4	
Pin 2	100,00%	100,00%	4	4	
Pin 3	100,00%	100,00%	4	4	
	Y2 Dectection %	R Dectection %	Y2	R	
Pin 1	100,00%	50,00%	4	2	
Pin 2	100,00%	100,00%	4	4	
Pin 3	100,00%	100,00%	4	4	
	Y2 w/h Dectection %	R 2/h Dectection %	Y2 w/ hand	R w/ hand	
Pin 1	100,00%	100,00%	4	4	
Pin 2	100,00%	100,00%	4	4	
Pin 3	100,00%	100,00%	4	4	

Unity Detection Analysis					Detection/Pins
Total Detection	Y1 Dectection %	B Dectection %	Y1	B	100,00%
Pin 1	100,00%	100,00%	4	4	78,13%
Pin 2	50,00%	75,00%	2	3	75,00%
Pin 3	75,00%	75,00%	3	3	
	Y1 w/h Dectection %	B w/h Dectection %	Y1 w/ hand	B w/ hand	
Pin 1	100,00%	100,00%	4	4	
Pin 2	100,00%	100,00%	4	4	
Pin 3	50,00%	75,00%	2	3	
	Y2 Dectection %	R Dectection %	Y2	R	
Pin 1	100,00%	100,00%	4	4	
Pin 2	50,00%	50,00%	2	2	
Pin 3	50,00%	100,00%	2	4	
	Y2 w/h Dectection %	R 2/h Dectection %	Y2 w/ hand	R w/ hand	
Pin 1	100,00%	100,00%	4	4	
Pin 2	100,00%	100,00%	4	4	
Pin 3	75,00%	100,00%	3	4	

Figure 54: The percentage of detection in precision test 1

The results from the first test (figure: 54) in the IDE showed a very stable connection other than a few disconnections which are the data points with 50% detection rate (Pin1 Y1,Pin2 Y1 and Pin1 R) which means the blocks did get detected at one point, but due to it being unstable it stopped getting detected in-between. Which cause the maximum to be 510.

On the unity side, the instability was becomes much more visible with Pin2 and Pin3, But the Pin3 disconnection may be due to a limit in the transfer of the messages from the IDE and not the actual pins themselves. No concrete conclusions can be made but comparing to the second test (figure: 55) which the two test values are more align it seems that the message limit problem is likely.

IDE Detection Analysis					
Total Detection	Y1 Dectection %	B1 Dectection %	Y1	B1	Detection/Pins
Pin 1	100,00%	100,00%	4	4	100,00%
Pin 2	0,00%	0,00%	0	0	79,17%
Pin 3	100,00%	100,00%	4	4	100,00%
	Y1 w/h Dectectic	B1 w/h Dectection %	Y1 w/ hand	B1 w/ hand	
Pin 1	100,00%	100,00%	4	4	
Pin 2	100,00%	100,00%	4	4	
Pin 3	100,00%	100,00%	4	4	
	Y2 Dectection %	B2 Dectection %	Y2	B2	
Pin 1	100,00%	100,00%	4	4	
Pin 2	100,00%	100,00%	4	4	
Pin 3	100,00%	100,00%	4	4	
	Y2 w/h Dectectic	B1 w/h Dectection %	Y2 w/ hand	B1 w/ hand	
Pin 1	100,00%	100,00%	4	4	
Pin 2	100,00%	100,00%	4	4	
Pin 3	100,00%	100,00%	4	4	
	Y3 Dectection %	R Dectection %	Y3	R	
Pin 1	100,00%	100,00%	4	4	
Pin 2	50,00%	100,00%	2	4	
Pin 3	100,00%	100,00%	4	4	
	Y3 w/h Dectectic	R w/h Dectection %	Y3 w/ hand	R w/ hand	
Pin 1	100,00%	100,00%	4	4	
Pin 2	100,00%	100,00%	4	4	
Pin 3	100,00%	100,00%	4	4	

Unity Detection Analysis					
Total Detection	Y1 Dectection %	B1 Dectection %	Y1	B1	Detection/Pins
Pin 1	100,00%	100,00%	4	4	100,00%
Pin 2	0,00%	0,00%	0	0	70,83%
Pin 3	50,00%	100,00%	2	4	70,83%
	Y1 w/h Dectectic	B1 w/h Dectectic	Y1 w/ hand	B1 w/ hand	
Pin 1	100,00%	100,00%	4	4	
Pin 2	100,00%	100,00%	4	4	
Pin 3	0,00%	100,00%	0	4	
	Y2 Dectection %	B2 Dectection %	Y2	B2	
Pin 1	100,00%	100,00%	4	4	
Pin 2	0,00%	100,00%	0	4	
Pin 3	25,00%	100,00%	1	4	
	Y2 w/h Dectectic	B1 w/h Dectectic	Y2 w/ hand	B1 w/ hand	
Pin 1	100,00%	100,00%	4	4	
Pin 2	100,00%	100,00%	4	4	
Pin 3	50,00%	100,00%	2	4	
	Y3 Dectection %	R Dectection %	Y3	R	
Pin 1	100,00%	100,00%	4	4	
Pin 2	50,00%	100,00%	2	4	
Pin 3	75,00%	100,00%	3	4	
	Y3 w/h Dectectic	R w/h Dectectior	Y3 w/ hand	R w/ hand	
Pin 1	100,00%	100,00%	4	4	
Pin 2	100,00%	100,00%	4	4	
Pin 3	50,00%	100,00%	2	4	

Figure 55: The percentage of detection in precision test 2

In the second test (figure: 55), The IDE showed some problem with Pin2 with Y1 and Y3 blocks where the Y1 did not get detected at any point, and in-between disconnection with Y3. Similar to how the unity part of the test amplify the instability of the blocks, in the Unity part it also shows that Pin2 and Pin3 have problems while Pin1 do not, but as mentioned above Pin3 might be problems with the message limit with Ardity.

The Pins detection percentage is as followed: First precision test; Arduino IDE

- Pin1 = 57.5%
- Pin1 = 93.8%
- Pin1 = 100%

Unity

- Pin1 = 100%
- Pin1 = 78.1%
- Pin1 = 75%

Second precision test; Arduino IDE

- Pin1 = 100%
- Pin1 = 79.2%
- Pin1 = 100%

Unity

- Pin1 = 100%
- Pin1 = 70.8%
- Pin1 = 70.8%

Out from these detection percentages, it shows that Pin2 has the most problem followed by Pin3 in Unity whereas Pin1 have 100% detection rate.

7.4 Final test evaluation

7.4.1 Results from Demographic

Before the test participants had to make the test, demographic information was taken to see what age, gender, and music experience the individual participants had before testing. This was done to show who we tested on, and to see if there were any noticeable conclusion/differences/discussions that could be found from the results.

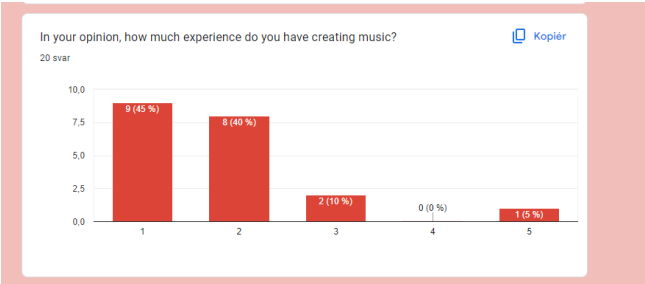


Figure 56: Graphic showing the test participant's experience in creating music

The 2 other graphs with the participant's age and gender can be found in Appendix.A.11

7.4.2 SUS results

The System Usability Scale (SUS) test was conducted to gather insightful quantitative data. The results of the testing shows the mean score being 64.8, with scores ranging from 27.5 to 87.5. The distribution of the data is shown here.

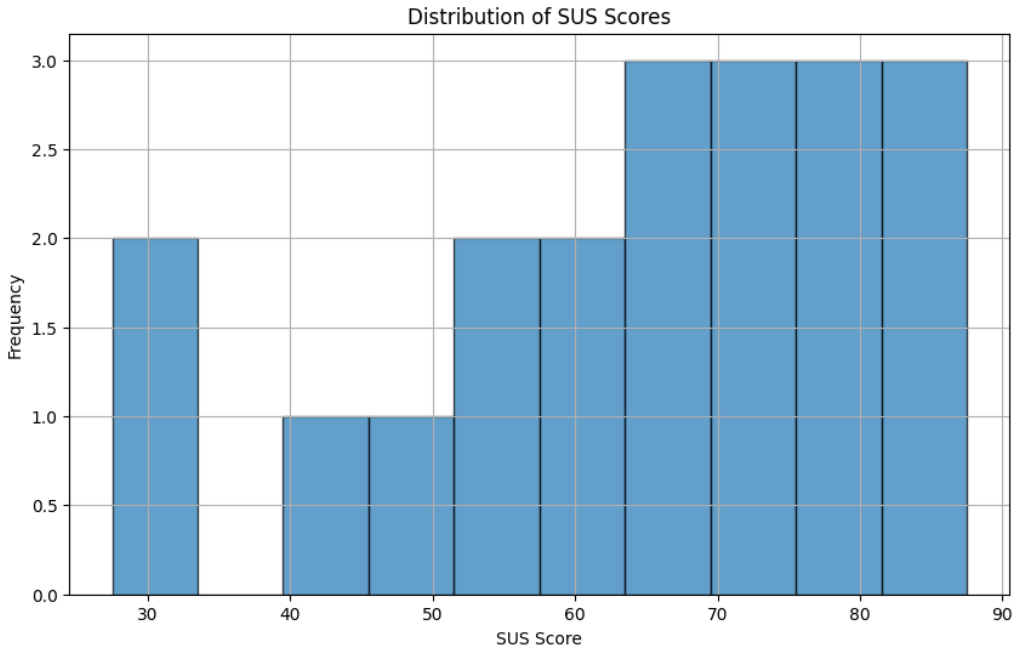


Figure 57: The distribution of SUS scores

It can be seen that the distribution have a clear negative skewness, meaning that the majority of the data-points lies in the right-side. It can also be seen that the tail pulls the mean and median towards the lower values. The median is found to be 66.25, which makes sense to be higher than the mean because of this skewness.

```
susvalues = [62.5, 67.5, 72.5, 85, 80, 62.5, 77.5, 75, 27.5, 80, 82.5, 47.5, 52.5, 40, 65, 72.5, 32.5, 55, 65, 87.5]
mean_valuesus = np.mean(susvalues)

print("Mean:", mean_valuesus)
```

```
Mean: 64.5
```

Figure 58: SUS scores and the mean

The mean value of 64.8 shows that the participants perceived the overall usability of the product to be below average. It can also be seen that there are two participants that score

significantly lower than the rest of the scores, being 27.5 and 32.5, which when filtered, make the mean score go to 68.3, which in turn make the overall usability average.

7.4.3 User engagement scale results

Along with the SUS scale, a User engagement scale (UES) was also conducted. The user engagement scale is divided into 4 sub-scales, being: Focused Attention, Perceived Usability, Aesthetic Appeal, and Reward Factor. The full results for the overall engagement and for each of the sub-scales for each of the participants can be found in appendix (See Appendix: 71) The summarized results for the overall score, and each sub-scales are listed here:

- OA (Overall Engagement): Mean: 3.77, Median: 3.83, σ: 0.49
- FA (Focused Attention): Mean: 3.51, Median: 3.66, σ: 0.63
- PU (Usability Usability): Mean: 3.86, Median: 4.00, σ: 0.84
- AA (Aesthetic Appeal): Mean: 3.76, Median: 3.66, σ: 0.56
- RF (Reward Factor): Mean: 3.95, Median: 4.00, σ: 0.54

It is expected that the σ is high because of the amount of participants is a total of 20, therefore the data is more spread out, and the values at the end of the ranges values more. When testing for normality in the overall and the sub-scales, a Shapiro-Wilk test was performed, a quantilequantile (Q-Q) plot and a density plot were made. The Shapiro-Wilk test measures how closely the distribution of the data matches a normal distribution, from a scale 0-1, where the closer to 1, the closer it follows a normal distribution. Along with the Shapiro-Wilk test, a p-value was gathered, that is the probability of obtaining results again, that are as extreme or more as this dataset. A null (H0) and Alternative hypothesis (H1) have been set up to see if the data is normally distributed:

- Null Hypothesis (H0): The data is normally distributed
- Alternative Hypothesis (H1): The data is not normally distributed

So if the p-value is greater than the significance level, at 0.10, the H0 is failed to be rejected, meaning that there is not enough evidence to say that the data is not normally distributed, therefore it can be assumed that is it normally distributed.

Here are the results from the Shapiro-Wilk test, together with its p-value: **FA:** Shapiro-Wilk:

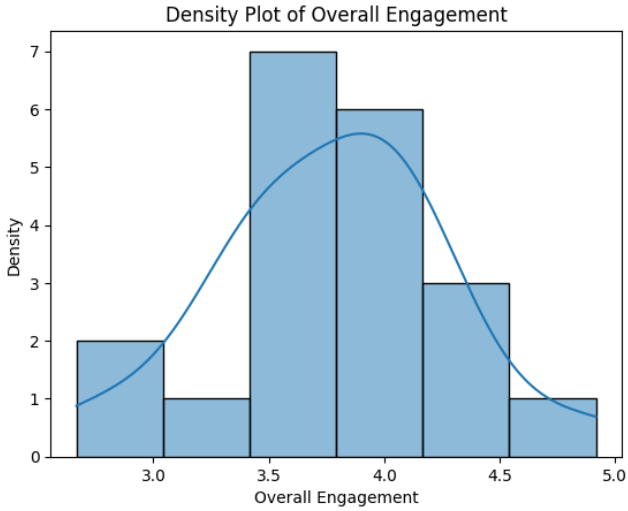


Figure 59: Density plot of overall engagement

0.92, p-value: 0.10

PU: Shapiro-Wilk: 0.93, p-value: 0.15

AA: Shapiro-Wilk: 0.96, p-value: 0.66

RF: Shapiro-Wilk: 0.93, p-value: 0.17

OA: Shapiro-Wilk: 0.970, p-value: 0.75

It can be seen that none of the p-values are 0.10 or lower, and therefore fail to reject the null hypothesis (H0), and can assume that the data is approximately normally distributed. All the different scales have a relatively high Shapiro-Wilk test for normality score This normality can also be visualized with a density plot, here is one shown of the overall engagement graph:

The density plots for the sub-scales are in appendix (See Appendix: A.19). The Q-Q plots for the sub-scales, this compare the distribution of the dataset to a theoretical normal distribution, is also in appendix (See Appendix: A.19). The line drawn at a 45-degree reference is the line the data-points should follow for the theoretical distribution, so points closer to it, mean more similarity.

7.4.4 Interesting observations

Because of the inherent properties of the product also being physical, wear and tear is bound to happen, and therefore the stability of the connections the blocks have. The results from

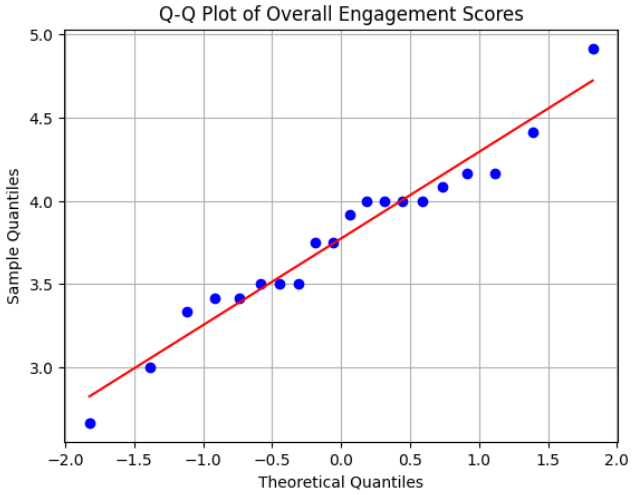
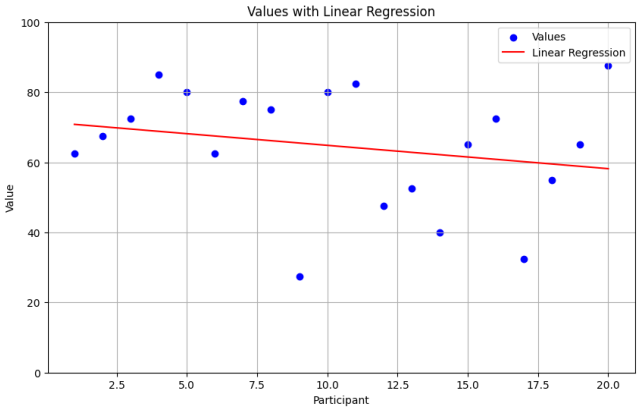
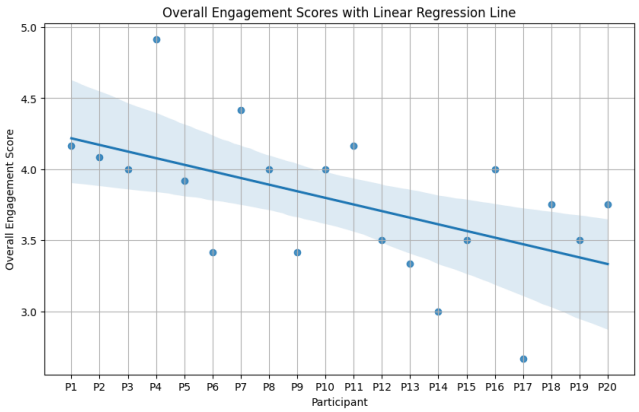


Figure 60: Q-Q plot of the overall score

both the SUS and UES reflect this, by having a general lower score, the later the participants were tested. This observation could also be a correlation, and not a causation just be caused by the participants tested on, or the other factors that the testing could have no control over, like later testing were done in the late afternoon.



(a) Linear regression of SUS score



(b) Linear regression of UES score

Figure 61: Linear regression of both questionnaire

7.5 Content Analysis from interviews:

Through this, the report can systematically and impartially examine textual, visual, or auditory data by using content analysis. This methodical methodology guarantees repeatability and reliability of the study, while also assisting in the reduction of bias.

7.5.1 Research Objectives:

The goal with this research is to get the test participant's thoughts on the hands-on blocks, reflection on features, and theoretical question about how they think, on how the target group (middle school children) would interact with the product.

7.5.2 Initial Notes from Interviews

- **Intuitiveness of translation between physical and digital:**
  - Initially difficult, but became easier with experience.
  - Initially confusing but understandable after use.
  - Found it intuitive and easy to use.
  - Very intuitive, easy to See if things matched up.
  - Well integrated, easy to match blocks on screen.
- **Impact of hands-on blocks:**
  - Improved experience, found it funny and easy.
  - Found them fun and engaging.
  - Enhanced the experience, found it easy to handle.
  - Easy to use, did not feel stressed.
  - Found it cool, but not overly exciting.
- **Exploratory features:**
  - Effect block was a notable addition.
  - Enjoyed mixing different elements.

  - Liked the variety and customization options.
  - Enjoyed the customization options for music.
  - Enjoyed seeing the effects of different blocks.
- **Enjoyable aspects:**
  - Enjoyed the robot dancing and creating music.
  - Freedom to experiment and mix elements.
  - Appreciated the open-ended nature and freedom.
  - Open-ended nature and freedom to do what they want.
  - Making different sounds and effects was fun.
- **Challenging/frustrating aspects:**
  - Initial difficulty in connecting physical and digital aspects.
  - Misunderstood placement of blocks initially.
  - Had to reread instructions but found it straightforward afterward.
  - Had to reread instructions initially.
  - Needed clearer instructions for using blocks.
- **Use as a middle school child:**
  - Would use it, found it funny and playful.
  - Would find it fun and engaging.
  - Likely to use it as a toy or learning instrument.
  - Would use it, interesting due to previous experience with the violin.
  - Would use it as a fun introduction to music.
- **Effectiveness for children:**
  - Physical blocks and interactive elements were most effective.
  - Na/N

  - Na/N
  - Colors and recognizable building blocks are effective.
  - Physical blocks and the interactive nature.
- **Future improvements:**
  - Make instructions and placements clearer.
  - Na/N
  - Na/N
  - More instruments and options, especially stringed instruments.
  - Clearer instructions and more variety in blocks and instruments.

7.5.3 Conclusion of Content Analysis

Here is a summary of the key findings:

Thoughts on Hands-On Blocks

- Participants generally found the hands-on blocks to be intuitive and engaging.
- Initial difficulties were noted, but familiarity increased with usage.
- Physical interaction with the blocks was perceived as enhancing the learning and engagement experience.

Reflections on Features

- Participants enjoyed the exploratory features, especially the effect block and customization options.
- The open-ended nature and freedom to experiment were particularly appreciated.
- Common challenges included initial confusion and the need for clearer instructions.

Theoretical Perspectives on Target Group Interaction

- Participants believed that middle school children would find the product fun and engaging.

- The physical blocks and interactive elements were seen as effective in capturing children's interest.
- Suggestions for improvement included the addition of more instruments and clearer instructional guidance.

Implications The findings indicate that the hands-on blocks are a promising tool for engaging middle school children in musical creation and learning. The positive feedback on the exploratory features and the intuitive nature of the blocks suggests that the product has the potential to be both educational and entertaining. However, addressing the initial difficulties with clearer instructions and adding more variety in the blocks and instruments could enhance the overall user experience.

Concluding Remarks

In conclusion, the hands-on blocks show significant potential as a tool for musical education and engagement among middle school children. By addressing the identified challenges and incorporating the recommended improvements, the product can be further refined to better meet the needs and preferences of its intended users. This research contributes valuable insights into the user experience and offers a solid foundation for future developments.

7.6 Keyword analysis of the interviews:

The keyword analysis was conducted to identify the most frequently occurring words and phrases in the interview data. This analysis helps in understanding the main themes and areas of focus among the participants. Python code was used to compile the interview transcripts into a single text document. Common stop words were omitted in order to concentrate on important keywords. Every word's frequency was tallied, and words that had similarities were categorized into themes.

7.6.1 Results:

The most frequently occurring keywords and their associated themes are summarized in Table (3). A word cloud representing the keyword frequencies is shown in Figure (62).

Keyword	Frequency
blocks	10
funny	5
physical	4
easy	4
block	4
first	3
music	3
two	3
sound	3
interesting	3

Table 3: Frequency of Most Common Keywords

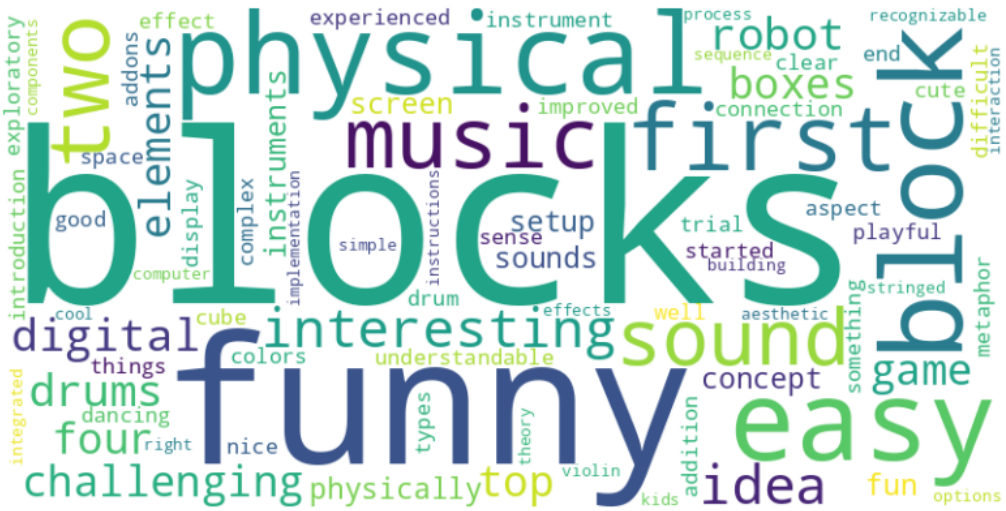


Figure 62: Frequency of Most Common Keywords as word cloud

7.7 Observation Results

When observing test participants, different noteworthy results came through. All the observations results can be seen at (See Appendix: A.17)

All of these problems are shown below with the diagram, where all the observations errors/notes are shown. It's to be noted that this diagram only shows errors/notes that has a frequency above 3.

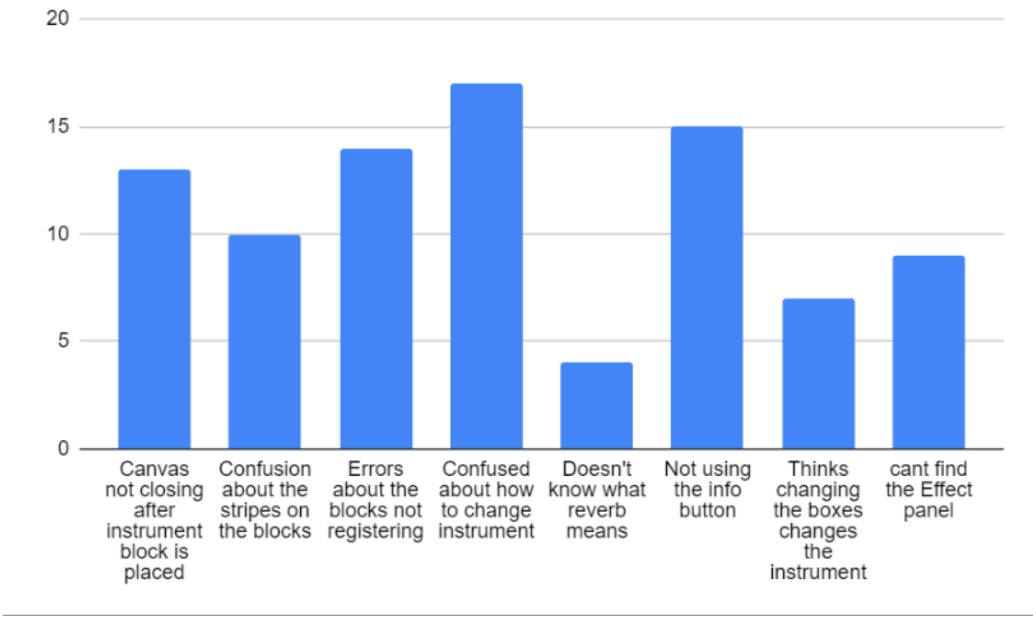


Figure 63: Observation notes/errors found while doing the final test

These observations will be talked about later in the discussion in how this could be changed/avoided.

8 Discussion

This section aims to discuss the results, and analyze the findings from prior sections.

8.1 Discussion of Design

The modular music block system's user experience was made more user-friendly by the implementation of Don Norman's design concepts. Through a careful consideration of his principles, we were able to create a product that is suitable for our target market of middle school students. These guiding principles for the iterative design approach enabled ongoing improvement and alignment with user expectations and demands. (See section: 5.5.) While the final test, also discovered more things that could be improved upon.

The final implementation of our modular music blocks involved a major change from the original concept. In the beginning, we had an idea for the tangible system in which blocks of parameter may be connected in any direction (X, Y, or Z axes) to provide the greatest possible flexibility in block placement. But realistic concerns about electrical interconnection, cost, and physical stability forced a change to a more straightforward design with connections limited to the Z-axis. (See section: 5.2.2)

A reason for the logo for each individual block was to establish the way the blocks should be facing, but some participants still placed them the wrong way, as seen in the final test, task 2, where some put the instrument-block onto of the drum-block (See figure:63). The issue may stem from the placement of logos on all four lateral sides, because participants consistently distinguished between the top and bottom of the blocks. By placing the logo on only two lateral sides, participants would understand that the logos indicate a specific orientation. Providing clearer instructions in the manual or within the software itself may also aid in addressing the issue. Additionally, constraints in the design could facilitate block placement.

It can be argued through the result of the final test, that more changes needed to be done to make the interface clearer, people had a hard time finding the reverb in the effects page, and went to other effects instead, either from the design or not knowing what reverb is (See figure: 63. Therefore, while succeeding it needs to be make more clear, specially if it's meant for the age group of 912, without the need of familiarity of music creation.

A noticeable error was that people found it difficult to change instruments, with them not knowing that the instrument could even be changed, as seen on the graph regarding observation notes/errors in evaluation, with the observation being present 17 times out of 20 out of the maximum observations. (63)

This was in regard to the task "Change the type of instrument", where people frequently thought that changing the type of music played by the same instrument was the same. This goes hand in hand with the regards that people also rarely used the info button for help regarding this issue. A solution would be to either make the presence of the info button more clear or a greater indicator that the icon to change instrument is clickable.

It was found by the test participants that many of them had never played music before (See section: 7.4.1), so they had difficulty understanding the meaning of the various terms for effects. This made it difficult for people to understand what the effects actually did, so a clearer explanation of what they did could help the product. On the flip side, the results could also be interpreted that the product was easy to use and understandable, as even people with no prior music experience give the product good reviews on the SUS scale and were satisfied about the product in their interviews.

One of the more prominent errors in our design was found when testing the tasks as users found the use of copper tape on our blocks confusing as some blocks have had extra tape put on to help with the voltage measurements. This made some of the test participants confused, as they thought that the ones with more tape only fit in certain spots, or that they could only be connected with the same amount of straps (See figure: 5.2.2. A solution to this would be to rework the blocks, so the straps would work better.

8.2 Scalability of product

In the evolved design process, the grid scale would have been intended to be 3x3, instead of the 3x1 that we went with, but because of the main functionality of the product could be achieved with only one row instead of three, a 3x1 version as chosen to be made.

8.3 Stability of electrical connection

The block's modular design aimed to maximize user convenience by using magnets to hold the blocks in place and copper tape for electrical connections. However, this approach led

to unstable connections, causing the values read by the Arduino to fluctuate. Sometimes, it received higher values than expected or no signals at all. In the second iteration, we replaced the resistor to increase the range between values and block combinations, but signal reception issues, particularly with Pin 2, persisted. Pin 3 also failed to receive signals due to message limits in Unity, resulting in ignored messages. By the end, Pin 2 and Pin 3 were the primary pins with connection problems.

The stability of the connections was not optimal when the first usability test was conducted. However, due to time constraints, there was little opportunity for further refinements before the test. The risk was deemed acceptable for the test, as the primary goal was to gather participant feedback on usability and user experience, which was considered more critical than the technical issues. The feedback identified issues in usability and user experience, which were weighed higher than the technical issues.

The box-plot from the first precision test shows greater fluctuations in the IDE compared to Unity measures. This is unexpected because Unity measures should have additional data transmission links from the IDE to Unity according to our hypothesis. One possible explanation is that Unity has better buffering mechanisms that can smooth out fluctuations, or it could be an uncertainty based by not having enough data-points. However, inside the IDE, the values were more precise when comparing the block's real value it should have. This issue was fixed by the second precision test, showing that the design of the blocks influenced these fluctuations. Although alternative methods for establishing electrical connections were considered, the focus remained on gathering participant feedback, therefore remaining using resisters through the iterations.

8.4 How the test translated to the target group:

The interviews yielded significant insights into the product's potential for improvement as well as the user experience. After a slight learning curve, the participants deemed the hands-on blocks to be intuitive and interesting in general. Many users reported that although switching from in-person to virtual engagement was difficult at first, it got easier with practice. This emphasizes how crucial user onboarding and early assistance are to smoothing this shift.

The capacity to customize and observe the impacts of various blocks were particularly enjoyed

by the participants, who also valued the exploratory aspects and its flexibility. This shows that there is a high level of involvement and that the product effectively encourages this.

Nonetheless, a number of difficulties were noted. More detailed instructions were required since users frequently had trouble figuring out how to connect the physical blocks to the digital interface. Furthermore, it was challenging to determine the purposes of several of the blocks, indicating that the user experience may be improved by visual signals and more user-friendly design components. By addressing these problems and making block operations more intuitive and the instructions more clear, user annoyance might be greatly decreased, and overall satisfaction raised.

Positive theoretical viewpoints were expressed in the interview regarding middle school students' interactions with the product. Participants thought the product would be entertaining and interesting for them as children, and that the interactive features and real blocks would be especially useful in holding children' attention. More instruments and more precise instructional instructions were suggested as ways to improve the product.

The interviews concluded that while the hands-on blocks have a great deal of promise to interest and instruct middle school students, it will be important to overcome the first difficulties with better visual signals and instructions. These enhancements will enable the product to better satisfy the requirements and tastes of the target group and deliver a more fluid and pleasurable experience. (To See full interviews: A.13.1, and to See evaluation; 7.5)

8.4.1 Features Implemented for the Target Group

Children in the age 9-12 can easily explore and utilize the device with little assistance because of the straightforward and intuitive design of the digital interface. This is essential to keeping their interest and enabling them to concentrate on creativity as opposed to details.

They can play with various combinations and sounds thanks to the open-ended nature of the blocks, which encourages creativity and exploration. The participants especially valued this feature since it gave them the opportunity to experiment and personalize with other musical elements.

They are guided through the interface and usage of the product by a child-friendly mascot called KVN in the manual, who offers an entertaining and engaging approach for them to become familiar with the functions of the product. The mascot's reactions to the children'

activities keep them engaged and add fun to the learning process.

8.5 Discussion of results

The results of the test done, have two different scores, that are on each side of the 68 mark, being the average score. There can be multiple reasons for this occurrence, the main difference on the two test was the sample size, where the higher score came from the lower sample size. The reliability of these results are less, because it's not as representative, while the higher sample size gave increased reliability, but at 20 total, individual biases or outliers can still influence the overall score. The validity of both test were presumably valid, in terms of measuring the usability. In the context of participants selection, the validity could have been more precise, by testing on the actual target group, but even with the use of convenience sampling, it can still be used to predict the reflections a broader user base might have. Both tests had consistency in the way that it was conducted, with the roles of the researchers, the setup in the environments being the same, and using the same computer for the test.

8.6 The delay in block spawning and its impact

In order for the system to correctly identify each block and read its parameters, there must be a delay. During this stabilization phase, any tiny vibrations or movements that might happen during placement weakens the sensors' ability to verify the blocks. In the absence of this delay, the user experience could become unclear, as the system could record false positives or negatives. (set reference here from impacts)

Users might find such a delay annoying, with the expectation of immediate feedback from the system. Through this, it can lead to confusion on why the block is spawning immediately, especially when it comes to the age group 912 years old. Who may have less understanding of why they have to wait. Through this, it made be perceived as a form of lag or a flaw in the systems' responsiveness. Positively, the delay might be viewed as a necessary component of the learning curve. It strengthens the connection between the block placement and its impact in the digital software, by providing users with a brief opportunity to comprehend the relationship between their physical actions and the digital reaction.

Therefore, without finding a new way to ensure stabilized connection between blocks, different things could be added to ensure the user is more aware of the block is coming. Adding

feedback mechanisms in the software, such as a loading icon, to make the user more aware the blocks are on their way, would be the most easily understandable.

It was seen in our own testing of the blocks on, some computers had an easier time getting a fast and reliable connecting, while other computers struggled more. Since the same physical Arduino setup was used, there were still differences, alluding to it have to do with the actual computer. One reason this might have occurred could be small differences in the USB socket that the Arduino is plucked into, or other minimal differences that are beyond our control.

8.6.1 User Engagement Scale Results

When it comes to the User Engagement Scale done in the final iteration, a problem arises. Unlike the SUS which has a universally agreed upon benchmark value that can be compared to see if your product is good, it being 68, a user engagement scale doesn't. Another User Engagement Scale test would therefore have been required to make in iteration one to have a value that could be compared, to see if we have had an improvement, as right now the user engagement scale doesn't give any real results as there is nothing to compare to. This is cause a User Engagement Scale is a comparative test.

8.7 Testing and testing method

Because of the steeper curve to get the product to a minimal viable product (MVP), the time it took was longer than first anticipated, and therefore the testing of the first iteration was conducted rather late in the process. One of the reasons for the MVP to be more time-consuming than expected, were the physical implementations and the workflow limits that it sat made, because it was only possible to begin the implementation between the blocks and Unity when the blocks were finished.

8.8 Summary of Key Findings in discussion

In summary, the product aims to engage middle school students by making music composition approachable, enjoyable, and instructive. Through interactive and exploratory learning, its features are designed to satisfy the demands of this age group and assist in the development of a range of cognitive, emotional, and social abilities.

9 Conclusion

This segment summarizes the main conclusions and assessing whether the final problem statement was meet.

The final problem statement, states the following: *How does the integration of a hands-on modular music block with interactive simple digital audio station influence middle school children's engagement in musical exploration and experimentation?*

In this study, it was investigated the use of hands-on modular blocks with the integration of a digital audio workstation (DAW), creating a digital musical instrument with a tangible interface. The use of exploratory interviews helped the process setup guidelines and requirements, with the interview with 'Strøm til Børn' and, State of the art products. LEGO mind-storm for its modular children friendly modular building approach, GarageBand for its simplicity in its DAW features, and lastly Swiftables for its implementations of the functionality. This gave key insight into the methodology and directions for the testing and implementation. Research done on Don Norman's design principles help set criteria for how the structure of how the DAW should look like.

The method for how the testing was conducted, followed an iterative approach, utilizing a System usability scale, interviews, and user engagement scale, to evaluate the functionality of the overall product, both in terms of usability, but also enjoyment. From the feedback gathered from users though verbal and observatory observations in the first test iteration, improvements to the product, like stability of blocks connections and clearer instructions, were made. From this the final test was conducted that included a SUS, a UEG, interviews, and observations while the product was tested.

It's safe to say that the integration of the hands-on modular music block influences the engagement in musical exploration and experimentation. In terms of usability, our SUS scores, showed a below-average usability score, a mean score of 64.8. After filtering out merely two outliers, the usability score would increase from below-average to an average usability score being 68.3. This shows that through minor improvements, the usability would improve by a large margin. The User Engagement Scale, despite the usability challenges, had a mean score of 3.77 out of 5, highlighting that the product was rather engaging, with the reward factor being the highest of the sub-scales, with a mean of 3.95.

Through the use of post-season interviews, valuable feedback on how the product was viewed by the test participants, and how much they thought it aligns with the correct target group. Through the content analysis, it was discovered the test participant generally enjoyed the product, finding it intuitive and engaging, found the feature enjoyable, and the product could be seen fitting to the chosen target group. This was also backed up on the keyword analysis, where some of the most used words, were funny, easy, interesting.

We also observed the participant's curious and engaging demeanor. Our observations showcased how the participants enjoyed experimenting around, which aligns with our goal of fostering musical exploration. Although we tested with university students instead of middle school children, the results provide a positive indication of the products potential. The feedback provided by the test subjects in the final iteration, showcased that there is a need for more clear instructions and potentially a broader creative freedom, with it being more instruments, sounds, and effects, giving more musical expression. By solving these problems, it could solve the issues showcased in the final test, by boosting the product's usability and appeal. Future evaluations and tests with the intended target group are necessary to confirm these findings. Overall, our findings support the tendency that the integration has a beneficial impact on engagement and creative experimentation in music, thereby fulfilling the objectives of the final problem statement.

By combining interactive digital audio workstations with hands-on modular music blocks, the project effectively tackled the final problem statement and illustrated how this combination can improve musical exploration and experimentation. The results were encouraging, even though the testing was conducted on college students rather than the target middle school audience. The product's intuitiveness and engagement were highly praised; it had a mean System Usability Scale (SUS) score of 64.8, which increased to 68.3 when outliers were taken out. With a mean score of 3.77 out of 5, the User Engagement Scale revealed high engagement. It excelled in the reward factor, scoring 3.95 out of 5. These findings imply that the product may have a major effect on kids' musical engagement and creativity, with additional usability enhancements and extended testing on the real target group.

10 Future Work

This section aims to discuss the further needs, possibilities and changes to the product and research.

10.1 Future Testing

In future work, there will be a focus on testing the product on 9-12 year old schoolchildren. We were not able to complete this crucial testing phase in time for our project because of access issues to schools and time-related issues regarding implementation. This age group correspond with our product's target group and can offer important insights into the usability and engagements levels, thus testing with them is crucial.

For Danish students in the age group 912 years old, who are in grades 4 through 6, music teaching is required as part of the curriculum. By interacting with this group, we will be able to collect information about how well the product complements the creativity of the age group and how well it fits the target group.

A problem however arises when testing children in that it's difficult to make children participate in surveys, like a SUS, as they do not have the cognitive load for them to be able to answer truthfully in these situations. To counteract this the test should be observing how the age group is interacting with the blocks, what they find intuitive or challenging, and how engaged they remain over an extended use period, with the observation done in the final test, write down errors and noteworthy interaction, the children might have with the product. Interview designed with easy to comprehend questions, in focus groups to gives the children a sense of security could be deemed variable for qualitative feedback, as-well as the thoughts their teacher have, also observing the process.

It is important to be gathering comprehensive input from, educators, pedagogue and the students in the age group, to be able to improve the product from their feedback. This could be how many errors the teacher/pedagogue would take an estimated guess, based on the knowledge and skill level of their class. The students would try the product, and having that as a limit to see if the product would be a success.

In summary, it will be crucial to validate our product's design and functionality through practical testing with schoolchildren to make sure the target age range finds it entertaining

and exploratory.

10.1.1 Future testing with User Engagement Scale

As mentioned in discussion a problem arose with the user engagement scale as it was found, that there are no benchmark/value existing for knowing if the product is good or bad based on the results from the tests. If this type of test was decided to be included in a future test, a comparative test would then be needed to be made in order for the test to work, or some benchmarks from other studies or companies that also used the User Engagement Scale and could be used as a comparative value. It's to be noted that these test would have to have similar traits as the product made, in order for the comparison between the values to make sense. 8.6.1

10.2 Improvements to the product

10.2.1 Improvements to Software

During the final test, an issue was identified by the researcher conducting the tasks. Users had difficulty pausing the music, as they had to navigate back to the main page. This caused many users to spend extra time or resort to simply muting the music. A straightforward solution is to move the play and pause buttons to the top navigation bar, allowing users to control the music without leaving their current page.

Another issue is the limited use of KVN. Enhancing KVN's role as a guide could improve onboarding and user experience. KVN could assist users in understanding the program by providing help when needed. Users could click on KVN for guidance, similar to how Clippy, the paperclip assistant in Microsoft Office, functioned. This would eliminate the need for the info button, which only a few people pressed during the final test, (See section: 63. This could also make the product more educational, with Kvn being able to explain what reverb, distortion, and delay meant in a sound setting, with you clicking on him and then him being able to explain different auditory terms. This could also reduce the issue with people not knowing what reverb meant during the testing. (63)

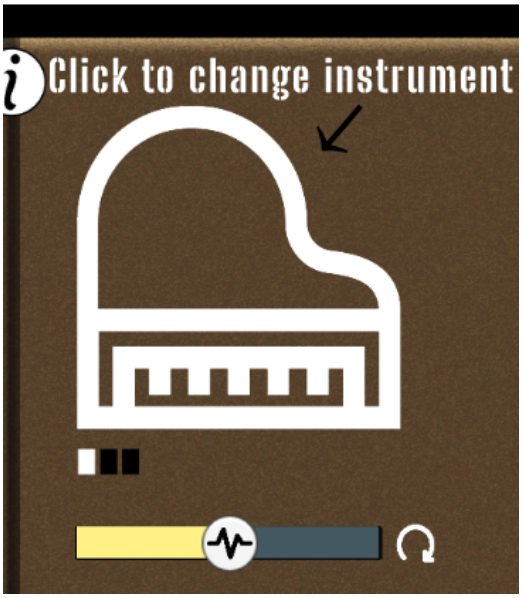


Figure 65: How a potential solution could be added to solving the issue regarding people not knowing where to click

Figure 64: Clippy, the paperclip office assistant character from Windows

A new design for how the instrument change could look like, giving more clarity to where to click, is shown here

Another improvement should be made to the instrument block's array of musical instruments. By adding more instruments, users can create a wider variety of sounds and enjoy a richer musical experience. This would be done by both giving a wider choice for the 3 instruments that were already implemented, being: piano, trumpet and guitar, but also having completely new instruments such as violin or saxophone. In addition to having a wider range of sounds, under-categories could be made, to specify the exact type of instrument or drum-sound. As it stands now, all kind of sound were in the same array. In the drum menu, it would have been preferable to control what type of drum-sounds to play, or in the instrument menu when selecting for e.g. a instrument guitar, there could be another menu that control what type of guitar sounds to chose from, like acoustic, electric or even banjo. This could also be implemented more simply by ordering the array of sounds, and giving them sections in the

selection array.

The ability for users to create and save their own sounds could be added. This feature would give users more control over the product and allow them to play the kinds of music they prefer. The interface for making music should be simple and intuitive, making it easy for users to create and use different sounds. This would also give users access to create voice recordings inside the program, that would coexist with the beat that they made. Along with this function, the ability to export / import files could create more collaboration between the users, where they can listen, share, and modify each other tracks.

Lastly, as some users suggested while testing, the software could have been converted into being used on an Apple IPad instead, as the only option you really have in the software is to click, which is also the only option on IPad's. This might also help it to be more accessible to children, as kids might prefer using a IPad however a complete overhaul of the Arduino would have been needed for it to work with IPad hardware, with it being able to connect through Bluetooth instead.

10.2.2 Improvements to hardware

One of the issues raised during the discussion was the copper tape connections between the blocks. There are a number of workarounds that could be implemented to maintain the modularity of the blocks, including soldering the wire to the magnets themselves and ensuring that the magnet faces can come into contact, or utilizing magnetic spring-loaded connectors. Since the wires would be physically soldered on to the connector components as opposed to copper tape, which is only taped on to the wires, these sorts of connections may ensure a more stable connections between the blocks and cause less fluctuations and disconnection.

A thing that could be changed is to expand the grid of the blocks with it evolving from a 3x1 to a 3x3, giving more options and more blocks would be available, as currently the user is limited to their creative thinking with the 3x1 grid for block placement. To evolve on this, the option for blocks to be connected through the X axis, as talked about in the initial concept, could be added back. This would increase the creativity for the user as they now had to think about 2 axis for putting blocks together, with the hardware now having a way bigger impact on what sound would be played, rather than just being a toggle on and off, as could

be argued it currently is.

10.2.3 Combined improvements to the hardware and product

If better connections are achievable, it opens the possibility of creating more varied block connections. For example, a drum block and an instrument block could be combined to create new types of blocks. This would also allow for the development of additional types of blocks, providing users with more options and enhancing the overall product.

References

[1] Jeffrey Hays. *Worlds oldest music: Flutes, neanderthals. lithosphones*. URL: https://europe.factsanddetails.com/article/entry-94.html.

[2] Neuroscience. *Musics universal pulse: Body and emotions unite across cultures*. Feb. 2024. URL: https://neurosciencenews.com/music-body-emotion-25664/.

[3] Psychiatry.org. Aug. 2023. URL: https://www.psychiatry.org/news-room/apa-blogs/power-of-music-in-mental-well-being.

[4] ScienceDaily. May 2018. URL: https://www.sciencedaily.com/releases/2018/05/180517123254.htm.

[5] Ewa A. Miendlarzewska and Wiebke J. Trost. *How musical training affects cognitive development: Rhythm, reward and other modulating variables*. Dec. 2013. URL: https://www.frontiersin.org/journals/neuroscience/articles/10.3389/fnins.2013.00279/full.

[6] Team ABKA. *Influence of music on social, emotional and cognitive development of children*. Jan. 2024. URL: https://activebrainacademy.ch/en/influence-of-music-on-development-of-children/.

[7] ROBERT J. ZATORRE. "Music and the brain". In: *Annals of the New York Academy of Sciences* 999.1 (Jan. 2006), pp. 4–14. DOI: 10.1196/annals.1284.001.

[8] Børne- og undervisningministeriet. Apr. 2024. URL: https://www.uvm.dk/folkeskolen/fag-timetal-og-overgange/fag-emner-og-tvaergaaende-temaer/folkeskolens-fag.

[9] Artur C. Jaschke et al. In: *Reviews in the Neurosciences* 24.6 (2013), pp. 665–675. DOI: doi:10.1515/revneuro-2013-0023. URL: https://doi.org/10.1515/revneuro-2013-0023.

[10] Strøm Til Børn. Apr. 2024. URL: https://strm.dk/stroem-til-boern/.

[11] Rubens Cantuni. *Designing digital products for kids: Deliver user experiences that delight kids, parents, and teachers*. Springer, 2020.

[12] Katie Sherwin and Jakob Nielsen. “Childrens UX: Usability Issues in Designing for Young People”. In: *Nielsen Norman Group* (2019). URL: https://www.nngroup.com/articles/childrens-websites-usability-issues/.

[13] Donald A Norman. *The design of everyday things. Revised and Expanded Edition*. Basic books, 2013.

[14] Enginess Enginess. *The 6 principles of design, a La Donald Norman*. 2014. URL: https://www.enginess.io/insights/6-principles-design-la-donald-norman.

[15] Edward Wegman and Yasmin Said. “Color theory and design”. In: *Wiley Interdisciplinary Reviews: Computational Statistics* 3.2 (2011), pp. 104–117.

[16] Emma Frid. “Accessible digital musical instrumentsa review of musical interfaces in inclusive music practice”. In: *Multimodal Technologies and Interaction* 3.3 (2019), p. 57.

[17] Robert Moog. “The musician: alive and well in the world of electronics”. In: *The Biology of Music Making: Proceedings of the 1984 Denver Conference. St Louis, MMB Music, Inc.* 1988, pp. 214–220.

[18] David Wessel, Matthew Wright, and John Schott. “Intimate Musical Control of Computers with a Variety of Controllers and Gesture Mapping Metaphors.” In: *NIME*. Vol. 2. 2002, pp. 1–3.

[19] Andy Hunt, Marcelo M Wanderley, and Ross Kirk. “Towards a model for instrumental mapping in expert musical interaction”. In: *ICMC*. 2000.

[20] Mahtab Ghamsari-Esfahani. *An evaluation of the role of mapping in skill acquisition on digital musical instruments*. McGill University (Canada), 2014.

[21] Salintip Sudsanguan, Sakchai Tangwannawit, and Thippaya Chintakovid. “Tangible user interface design for learners with different multiple intelligence”. In: *International Journal of Electrical and Computer Engineering* 11.4 (2021), pp. 3381–3392.

[22] Lea Duji Rodi and Andrina Grani. “Tangible interfaces in early years education: a systematic review”. In: *Personal and Ubiquitous Computing* (2021), pp. 1–39.

[23] Yunfeng Qi et al. “TanProStory: A Tangible Programming System for Children’s Storytelling”. In: *Proceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems, Seoul, CHI 2015 Extended Abstracts, Republic of Korea, April 18 - 23, 2015*. Ed. by Bo Begole et al. ACM, 2015, pp. 1001–1006. ISBN:

978-1-4503-3146-3. DOI: 10.1145/2702613.2732806. URL: http://doi.acm.org/10.1145/2702613.2732806.

[24] Mark Marrington. “Composing with the Digital Audio Workstation”. In: *The Singer-Songwriter Handbook*. Ed. by J. Williams and K. Williams. New York: Bloomsbury Academic, 2017, pp. 77–89.

[25] David Merrill, Jeevan Kalanithi, and Pattie Maes. “Siftables: towards sensor network user interfaces”. In: *TEI ’07: Proceedings of the 1st international conference on Tangible and embedded interaction* (2007). Visited 13-Mar-2024, pp. 75–78. DOI: 10.1145/1226969.1226984. URL: https://doi.org/10.1145/1226969.1226984.

[26] David Merrill. *Toy tiles that talk to each other*. The image showcase was a screen capture of the showcase David made in the video during TED2009. 2009. URL: https://www.ted.com/talks/david_merrill_toy_tiles_that_talk_to_each_other.

[27] Inc. Apple Computer. *GarageBand 10.3.4 - download for Mac Free*. Apr. 2020. URL: https://www.malavida.com/en/soft/garageband/mac/.

[28] Adam Bell. “Can we afford these affordances? GarageBand and the double-edged sword of the digital audio workstation”. In: *Action, Criticism, and Theory for Music Education* 14 (Jan. 2015), pp. 44–65.

[29] Apple. 2024. URL: https://www.apple.com/mac/garageband/.

[30] Lego. 2024. URL: https://www.lego.com/en-us/themes/mindstorms/about.

[31] Ernest Afari and Myint Khine. “Robotics as an Educational Tool: Impact of Lego Mindstorms”. In: *International Journal of Information and Education Technology* 7 (Jan. 2017), pp. 437–442. DOI: 10.18178/ijiet.2017.7.6.908.

[32] javatpoint. 2024. URL: https://www.javatpoint.com/software-engineering-iterative-model.

[33] John Brooke. “SUS – a quick and dirty usability scale”. In: Jan. 1996, pp. 189–194.

[34] Heather L. OBrien, Paul Cairns, and Mark Hall. “A practical approach to measuring user engagement with the refined user engagement scale (UES) and new UES short form”. In: *International Journal of Human-Computer Studies* 112 (2018), pp. 28–39. ISSN: 1071-5819. DOI: https://doi.org/10.1016/j.ijhcs.2018.01.004. URL: https://www.sciencedirect.com/science/article/pii/S1071581918300041.

[35] Will C van den Hoonaard. “Inter-and Intracoder Reliability [1,063 words]”. In: (2008).

[36] Rungtai Lin, P.C. Lin, and K.J. Ko. “A study of cognitive human factors in mascot design”. In: *International Journal of Industrial Ergonomics* 23.1 (1999), pp. 107–122. ISSN: 0169-8141. DOI: https://doi.org/10.1016/S0169-8141(97)00106-6. URL: https://www.sciencedirect.com/science/article/pii/S0169814197001066.

[37] *Ardity*. 2024. URL: https://ardity.dwilches.com/.

[38] *libPd*. 2024. URL: https://github.com/libpd/libpd.

[39] Record Union. *The 73 Percent Report*. 2019. URL: https://soundref.com/wp-content/uploads/2023/07/Record_Union-The_73_Percent_Report.pdf.

[40] David W Johnson and Roger T Johnson. *Cooperation and competition: Theory and research*. Interaction Book Company, 1989.

[41] Theodore Panitz. “Benefits of cooperative learning in relation to student motivation”. In: *Motivation from within: Approaches for encouraging faculty and students to excel, New directions for teaching and learning. San Francisco, CA* (1999).

[42] Marjan Laal and Seyed Mohammad Ghodsi. “Benefits of collaborative learning”. In: *Procedia - Social and Behavioral Sciences* 31 (2012). World Conference on Learning, Teaching Administration - 2011, pp. 486–490. ISSN: 1877-0428. DOI: https://doi.org/10.1016/j.sbspro.2011.12.091. URL: https://www.sciencedirect.com/science/article/pii/S1877042811030205.

A Appendix

A.1 Music and psychological well-being

In the pursuit of comprehending the landscape of music creation, an empirical interview was conducted with a key figure in the business of music. Notably, an interview was held with the spokesperson of the Danish Musical Association, a union for musicians. This dialogue illuminated various complexities of the music industry, and through their perspective, some key insights were derived, ranging from digitization and streaming to the harmony between mental health and career sustainability and music as a school subject.

The digital transformation was explored, as was the democratization of the creative process that the digital tools have provided since 2009. An extension of this was the complexities of the emerging of streaming platforms and their impact on musicians. While these platforms have widened the audience reach and provided opportunities for self-publishers, they have also engendered concerns regarding monopolization and diminished earning prospects for artists.

Additionally, the interview touched on the conflict between mental health and career sustainability, a challenge not confined solely to the Danish music scene but prevalent across the industry at large. This assertion finds resonance in a report by the digital music distribution Record Union, revealing that 73 percent of independent musicians reported experiencing symptoms of mental illness [Record Union 2019]. The interview underlined that musicians were the profession with the most mental pressure in their work.

"*(...) So it's actually the professional group in Denmark that experiences the greatest mental pressure for their work. And it's, among others, about the fact that it can become quite lonely to have this musician career.*" [Record Union 2019]

This sentiment is echoed in the Record Union report, which identifies fear of failure, financial instability, loneliness, and being evaluated as the primary drivers of negative emotions for musicians.

The full transcript of the interview can be found in (See appendix: A.3).

A.2 GitHub and Code

Link to Github: https://github.com/gulfurs/P4-Project

A.3 Transcript of interview with spokesperson of the Danish Musian Association

Date: 06-03-2014

[00:01:29] Interviewer: Yes, jamen først og fremmest, Mange tak for at vi måtte komme her i dag? Kan du starte med at introducere dig selv lidt om, hvad du laver her i Dansk Musiker Forbund?

[00:01:38] interviewee: Ja. Jeg hedder Gitte Welling, og jeg arbejder med vores presse, primært ekstern kommunikation. Og så rådgiver jeg også politikerne om de politiske emner som i dem vi arbejder med. Når jeg siger politikerne, så mener jeg vores vores sprogpersoner. Vi har tre, en forperson og to forpersoner, som udtaler sig i pressen for eksempel. Tager ud til konferencer og den slags. Så det er så mit arbejde at rådgive dem om, hvad de skal mene, hvad ville være smart og mene inden for de her områder. Det er også derfor, at jeg kan give jer nogle svar.

[00:02:13] Interviewer: Bare for at komme ind i det så. Hvad repræsenterer Dansk Musikerforbund?

[00:02:19] interviewee: Dansk Musiker Forbund er Danmarks største fagforening for musikere. Vi har lige knap 5.500 medlemmer, som alle sammen er professionelle musikere. De fleste af dem lever 100 procent af deres musik, men der er også en gruppe, som har andre job ved siden af eller som, eh ja bare ikke tjener så mange penge, som de gerne ville.

[00:02:47] Interviewer: Tusind tak for lige hurtigt at give en kort præsentation. Vi ville lige komme ind på hvad hedder det bare nogle interessepunkter her eller andet, så vil du se at der komme en faldende stigende på folks interesse for at spille musik herefter corona.

[00:02:59] interviewee: Det er svært at sige noget efter corona, og det handler også om, hvor kigger man henne? Der hvor vi kan se noget, når vi kigger på indtægt på musikundervisning på musikskolerne. Det er jo ikke som sådan i vores område, vi har en fagforening, så vi sidder ikke med det. Men vores medlemmer arbejder ude på musikskolerne som undervisere. Derfor

interesserer vi os lidt for det på børneområdet, på musikskolerne. Man kalder dem kultur og kulturskoler. Der kan vi se der er et fald. Men der er færre børn, der starter til musik, og vi kan også se frafaldet er større. Men de tal, vi har, de går frem til 2022. Det vil sige, det er svært at måle noget egentligt efter kommuner, der skal vente på de nye tal. Hvis vi vil kunne sige noget om, om der er sket et fald efter corona. Men vi kan se, at der sker et fald generelt. Til gengæld er der faktisk en lille stigning på voksenområdet. Altså sådan her de nye år er det sværere at få plads på som voksen, der gerne vil spille musik. Det er lidt spændende. Nu ved vi mest fra København, men vi kan også se, at vores medlemmer faktisk er booket. Dem, der underviser voksne.

[00:04:12] Interviewer: Det lyder mere som en fagforening. [00:04:14] interviewee: Jo dejligt, at man kan sige det betyder det noget statistisk? Det ved vi ikke endnu, men vi kan se, der er en tendens.

[00:04:21] Interviewer: Det kan også være spændende. i mailen skrev du at, du havde nogle tal og data både på individ stigning, men også jeres omsætning og andet. Er der noget du vil sige er ekstra interessant ved jeg som forening at byde fat i den data og andet som vi måske kunne have misset.

[00:04:39] interviewee: Det jeg har sendt til jer, der er der tror jeg man kan se hvornår fordelt på køn, at børnene stopper til musik, og der er en tendens til at pigerne stopper før drengene, og at den tendens man ser på hele børne ungeområdet, fritidsområdet, hvor piger stopper med at gå til fritidsinteresser i en alder af 14 til 16 år . Og den gør sig også gældende på musikområdet. Tit når man snakker om det i medierne, så er det så bliver det tilskrevet noget om som pigerne vil ikke gå i bad med hinanden, fordi fordi man tænker på det som sport. Men det er altså ikke sådan det forholder sig. Fordi når vi kigger på musikområdet, er det den samme tendens.

[00:05:24] Interviewer: Spændende. Og så hvad hedder det Nu har musik her de sidste 5 år ændret sig med, at vi blev mere og mere digitale og endda med noget andet, der bare kunne producere musik. Det er hvad der sker. En ændring via det.

[00:05:37] interviewee: Ja, men den er jo så altså den ændring vi kan se, den er jo noget ældre. Altså du skal tilbage til 2009, fordi meget musik fra fra 2009 og frem bliver produceret digitalt på alle mulige forskellige måder, og at man de sidste. 10 15 år er man også gået væk fra at se det som noget. Noget forkert eller noget anderledes. At musik bliver produceret

digitalt. Det er altså en helt naturlig del af processen, når man producerer musik, at meget af det ikke foregår på analoge instrumenter for eksempel. Der er selvfølgelig nogle, der stadig ikke synes er helt vildt fedt, og derfor gør de det ikke mere set Stranger Things. Jo, der er. Kate Bush har et tema nummer, der bliver brugt i en af de senere sæsoner og lønninger blevet hævet. Det lyder som sådan et helt standart popnummer. Det er det ikke. Hun er 19 år gammel, og hun laver nummeret så vidt jeg husker. Hun har bygget alle instrumenterne, der bliver brugt i det her nummer selv, fordi det lyder som om det har en digital lyd. Det har det ikke. Det er mekanisk, for der er ikke digital lyd på det tidspunkt, hvor hun laver det her nummer. Det gør det altså. Hun bygger en side for sig selv. Altså, det er faktisk. Som ingeniør projekt er det jo kæmpe vildt det her nummer. Men det lyder lidt som noget vi kender, og det er i virkeligheden det, der siger noget om digitaliseringen, fordi den lyd, som det nummer har, var helt enormt besværlig at lave i firserne. I dag, der kan stort set alle lave den.

[00:07:09] Speaker4: Og det er jo så også derfor.

[00:07:10] interviewee: At nummeret giver en genklang i dag, for det lyder som moderne musik. Så der er en digitalisering i processen omkring produktionen.

[00:07:21] Interviewer: Men hvordan? Hvad var der streaming? Hvad hedder det? Kan også spille rollerne som store musikere og mindre penge, eller hvad er det man hører om? Men udover det fik dig, vil du se nogle punkter, hvor Jimmy Nielsen har hjulpet musikere landet nemmere at komme ud med sin musik eller andet eller noget i den dur.

[00:07:39] interviewee: Streamingen har altså haft voldsomme konsekvenser. Musikerne, fordi de er svære at tjene penge på streaming, end det var dengang, man kunne sælge cd'er. Det skyldes også, at der er meget få udbydere af streaming, altså som du har monopol dannelse, som også betyder, at priserne bliver holdt kunstigt nede for musikerne. Altså at de får ikke det for deres arbejde de gerne ville have, eller som var rimeligt. Så det er den negative del af streaming. Men den positive del af streaming er jo, at det er, at alle nærmest kan udgive selv her. Dansk Musiker Forbund Der har vi et distributions bureau, hedder det. Det er jo det, man i gamle dage ville kalde pladeselskab og skabe en musical, hvor vi tilbyder vores medlemmer, at de kan udgive deres musik igennem. Så hjælper vi dem med at komme på streamingtjenester. Vi hjælper dem med at lave promotion af deres musik, men på den måde så beholder de faktisk rettighederne selv. I stedet for at der kommer et stort blandet pladeselskab som Sony eller Universal og har rettighederne. Det betyder også, at de kan få

flere af de midler, de tjener udbetalt for deres musik, end hvis de havde et stort pladeselskab. Og det er der mange musikere, der vælger at gøre. Og det er også en stigende tendens, at der er flere, der så at sige selvudgiver eller udgiver på på mindre institutioner firmaer.

[00:09:02] Interviewer: Hvis der er nogen, der oplever det ind i folden mest. I dag udgiver hedder det bedst eller går solo eller sådan, når du udgiver sammen? Sådan er jeg bare igen nu. Vi kigger ind her. Vi fik med Collaborative. Hvordan oplever du mest en stigning i folk solo album eller mere folks lyst til at spille sammen med oplevelser også for musikskoler, udgivelser og andet?

[00:09:21] interviewee: Det er svært at sige. Jeg tror ikke, der er den store ændring. Der er selvfølgelig den forskel, at du har nogle enkelte af de her solokunstner, hvor de spiller alle instrumenterne selv, fordi de gør det digitalt. Men det er ikke så udbredt, altså fordi musik er kollektivt og folk spiller musik sammen. Og musik er også en kollektiv oplevelse. Når du tager ud og spiller musik som musiker, så er det jo også for at have en kollektiv oplevelse med dit publikum. Så forestillingen om, at digitaliseringen så kunne gøre, at man så havde den her isolerede musiker, der sidder hjemme på sin mors værelse eller måske kalder og bygger musikken selv fra bunden. Altså, det er ikke super udbredt, fordi hvis du skal være en dygtig musiker, så skal det ske sammen med andre.

[00:10:07] Interviewer: Så du har at sige set det allerede kollektive men musik er vigtigt, så det vil sige det allerede der, nu nævner du også, at I havde musikskole. Ikke så meget med selvete musik eller kulturskole at gøre med, men med dem der underviste. Det vil sige, at når man kommer ind fra start af at skulle lære at lave musik, jeg for eksempel aldrig har spillet et instrument. Hvad vil du sige, vil du oplever det mere succesrate? Hvis jeg for eksempel gik ind og joinede en gruppe, hvor man lærte at spille sammen som ung eller man gik alene sammen med en lærer.

[00:10:32] interviewee: Typisk, så gør man begge dele, altså at på musikskolerne. Så vil du både typisk både have individuel undervisning og sammenspil, men det ser da, hvis du kigger på tallene. Som jeg har sendt til jer, der et fald i sammenspilshold. Det kan jeg ikke forklare dig, men der er et fald til gengæld, det ved jeg ik, det kommer vi nok ind på senere. Og jeg vil gerne fortælle om nogle af de projekter, der er i i grundskolerne og også med sammenspil. Hvor at nogle af vores medlemmer også arbejder på.

[00:11:11] Interviewer: Spændende

[00:11:14] Interviewer: Hvad hedder det, hvad inspirere og starter sådan processen i at sådan skabe musik for jeres, hvad hedder det, medlemmer, eller andet. Hvad der giver dem sådan lyst til det. Er det bare et helt naturlig drive, eller er der noget som man kan putte en finger på?

[00:11:24] interviewee: Det tror jeg er et helt vildt svært spørgsmål. jeg tror også det er meget individuelt, hvordan de forskellige musikere har det med at sige "Hvad er det lige, der gør dig inspireret?" Men jeg ved, det er noget, som vores medlemmer efterspørger ret meget er faktisk sådan nogle noget inspirationsdage inspirations kurser. Vi laver kurser i sangskrivning, hvor vi får musikere, der er dygtige sangskrivere til at komme og hjælpe med at facilitere processer og for andre musikere. For eksempel er det enormt meget bud efter. Så jeg tror også, at jeg tror tit, at man som musiker kan blive lidt isoleret. Fordi altså en musiker karriere er ret meget et individuelt projekt, og vi ved fra vores medlemmer, at der er nogle af dem, der samler savner kollegaer det vil sige dem man kan altså, fordi man ikke har et kontor, man kommer ind på. Hvornår er det så lige, man mødes med sine kollegaer og får snakket om de ting, man har arbejde med? Det er ikke kun musikken, men også alt det, der ligger rundt om det. Udgivelse indspilning. Ja, i virkeligheden promotion rigtig meget. Altså at have nogle kollegaer man kan sparre med, om så det er noget vi som fagforening som vi ligesom faciliterer for vores medlemmer, at de kan komme og møde hinanden.

[00:12:43] Interviewer: Apopro medlemer og du ved I som fagforening? Hvad hedder der kan i hjælpe med at inspirere og møde kollegaer eller andet der. Hvad ved hvad som fagforening vil i sige er det vigtigt er sådan for at kunne støtte folk i at være kreative i skabe musik, og folk har mulighed for lave musik.

[00:12:58] interviewee: Det vigtigste er eller ihvertfold den største udfordring, der er i forhold til det lige nu, er mental sundhed. Rigtig mange musikere oplever altså meget meget dårlig mental sundhed, mistrivsel, stress, depressioner. Det ved godt, det er noget vi snakker om, typisk med unge mennesker, men når vi kigger på musikerne, så er det faktisk den faggruppe i Danmark, der har størst mental pres for deres arbejde. Og det handler blandt andet om det her med, at det kan blive ret ensomt og værre, altså, at have den her musiker karriere. Det handler om en hel masse fordomme. Jeg tror, det er svært at møde musikere, hvis forældre ikke på et tidspunkt har sagt til dem måske skulle du prøve at tage en rigtig uddannelse. Og så handler det også om, at det er et enormt hårdt pres at skulle tjene penge

på den måde. Når jeg går på arbejde, så får jeg en månedsløn, og jeg ved, hvad jeg får hver måned. For musikere, der tager ud og spiller på spillesteder for eksempel, De får det, der hedder minimums tariffen, og så skal de så forhandle sig op derfra. Det er to et halvt tusind kroner, når de ude og spille. Det betyder, at hvis du vil op og have en månedsløn på omkring 40.000, så skal du spille stort set hver dag. Så er der ikke noget tid til at øve dig ikke noget tid til at forberede. Der er ikke noget tid til at sætte op, altså du kommer til at have en alt, alt for lang arbejdsuge.

[00:14:19] interviewee: Hvis du skal forsøge at tjene de penge, du har brug for, altså sådan et almindeligt arbejde. Det ligger et enormt pres. Samtidig så er der også pres i forhold til, at de ikke tør og altid at sige fra musikerne, når de bliver booket, fordi det er en chance. Så man kan også komme til at arbejde for meget, bare fordi man bliver booket meget, fordi man er populære. Så er der sådan noget som altså tours, hvor at du rejser og bor i en bus. Og bare arbejder og arbejder og arbejder og arbejder, og du er nødt til at gøre det, fordi. Musikfaget er faktisk også et sæsonarbejde. Der er Hvad hedder det? Kun 25 procent af de koncerter, der er om sommeren, om vinteren. Det betyder også, at der var meget mere rift om pladsen på scenen om vinteren. Men de fleste musikere tjener simpelthen deres penge i sommerhalvåret, og så bruger de vinterhalvåret til at være kreative og producere nyt materiale. Men hvis du ikke har tjent penge nok i sommerhalvåret. Så du ikke har råd til så at sige op nu citationstegn går arbejdsløs, fordi det ikke arbejdsløshed, fordi det er faktisk der, hvor du laver det materiale, du skal bruge næste sommer. Men hvis du ikke har råd til at producere materiale om vinteren, fordi du ikke tjener nok om sommeren, så har du ikke noget materiale til sommeren efter.

[00:15:38] interviewee: Så bliver du ikke booket, og så får du en nedadgående spiral på din karriere. Og det er noget, som rigtig mange musikere er bange for. Så er der også et bias i forhold til alder. Der er sådan en forventning om, at musikere de skal peake, når de er 20. Kunne i forstille jer, hvis det var jeres karriere, altså. Så skulle I have været der. Altså, det er også den der, den der forestilling, der gør, at man kan føle sig for sent på den. Altså vi har musikere på 23-24, som sidder og snakker om, at de føler, at de er for sent ude. Og det er os altså. Det giver også et voldsomt pres, og så kan vi se, der også er et kønsbias, som er meget voldsomt, og at rigtig mange kvindelige musikere oplever diskrimination, seksuel chikane, grænseoverskridende adfærd. Og igen, så har de jo et meget prekært arbejdsmarked. Det er det der med, hvis du siger nej til en booker, uanset om det er nej til at spille eller nej til

en tilnærmelse. Så er det også altså det jo en chance, der forbigår dig. Det penge du ikke tjener, men det er også fremtidige penge. Det er også det, der kunne have gjort dig stor. Der. Altså så det er meget at sige nej til, og det er svært at sige fra. Det er svært at være i så løse ansættelser.

[00:17:04] Interviewer: Det lyder meget spændende og øjenåbnende, det må jeg sige. (Øhh) Vi var også hurtigt ind på [...] Du nævner tidligere og andet, det du kom ind på og de forskellige grundskoler og andet musik. Hvordan er jeres oplevelse af de ting, der sker med musik i folkeskoler?

[00:17:23] interviewee: Der er musikundervisning i folkeskolen.(Øhh) Og der har været en helt masse diskussioner om, at musikundervisningen skulle være et karaktergivende fag, eller om det ikke skulle være det. Og alle de her ting. Musikundervisning i folkeskolen er fra vores perspektiv, lidt ligesom idræt. Idræt er et dejligt fag, som introducerer børn til forskellige sportsgrene. Musik er et dejligt fag, der introducerer børn til forskellige genrer af musik og lærer dem en lille smule basic om sammenspil. Du bliver ikke sportsudøver af at have idræt i folkeskolen, og du bliver ikke musiker af at have musik i folkeskolen. (Øhh) Der hvor at, man kan sige ilden tændes hos folk, og faktisk vælger en karriere inden for musik senere hen. Det er, når de har undervisning på musikskolerne, men det er også, når de bliver introduceret for musik i folkeskolen, af professionelle musikere. Der er lige nu tre ret fede projekter, som tager rundt på folkeskolerne, som netop gør det her med at introducere forskellig musik til børnene. Der er noget der hedder Orkester-Mester, som er et projekt, hvor børnene laver deres eget orkester og laver sammenspil. Så er der Levende musik i skolen, som er koncerter med professionelle musikere, der kommer ud og viser, hvordan de spiller deres instrumenter og giver børnene en indlevende oplevelse af, hvad er det egentlig, en trompetist arbejder med og laver koncerter på den måde, og det er et super fedt projekt.

[00:19:00] interviewee: Og så er der Strøm til Børn, som laver elektronisk musik. Og det er måske i forhold til det projekt i sidder med. Der er det måske værd at kigge ind i Strøm til Børn og se; hvad er det egentlig, de har at udbyde til folkeskoleelever? Og hvad for nogle redskaber arbejder de med? Jeg kender ikke projektet specielt godt. De har fået penge på finansloven for anden gang (Øhh) til at lave det her (Øhh) elektronisk musik med børn, og det er også noget af det, som det er noget, folkeskolerne efterspørger ret meget Strøm til Børn, fordi det er billigt og giver folk altså giver børnene en god introduktion til, hvordan

de selv kan producere musik, uden at man skal kunne stille alle mulige instrumenter til rådighed. Det er en udfordring på mange folkeskoler, at de ikke har instrumenter nok til klasserne.

[00:19:47] Interviewer: Strøm til Børn lyder rigtig spændende, det tror vi helt klart at vi skal kigge ind i [...] Der er ikke flere spørgsmål på listen og andet der. Har du noget interesseret at spørge eller tale om?

[00:19:59] Interviewer2: Nej, ikke umiddelbart, umiddelbart.

[00:20:04] Interviewer: Jamen så tror jeg bare vi siger tusind tak for, at vi måtte få lov til at interviewe. Og tak for hjælpen.

[00:20:12] Interviewer2: Var der eventuelt noget du ville vise, eller var det i forhold til noget andet?

[00:20:20] interviewee: Nej, jeg tror ikke, jeg har noget, jeg lige ville vise jer. Det var bare nej, der er. Jeg tror-jeg tror i forhold til de spørgsmål, i har stillet og sådan noget, så tror jeg, at det nogenlunde er det her, der er. (Øhh) Jeg har alt mulig statistik på køn, og jeg har al mulig statistik på musikernes arbejdsvilkår. Så hvis der er noget I får brug for af den type, så kan jeg sende sådan noget til jer. Men-men de der, altså, jeres spørgsmål er ret brede og sådan noget; Men hvordan-hvordan ser befolkningen det? Hvad er det-Hvad er tendenserne og sådan noget? Og det er faktisk lidt svært, fordi det ved vi ikke, fordi vi er en fagforening.

A.4 Transcript of interview with spokesperson of the Organisation Strøm til Børn

Date: 19-03-2014

Part 1:

Interviewer1: [00:00] Hvis vi ligger den lige her. Så når. Vi starter bare helt på toppen. At man lige kan få en start med hvis du kunne introducere dig selv.

Speaker: [00:17] Ja, Jeg hedder Jeanette Frederiksen, og jeg er projektansvarlig for Strøm til børn, undervisnings og projektansvarlig, og det er min rolle her på stedet, og strøm til børn ligger i den her musik organisation som Strøm og Strøm laver både festivaller, men laver så

også det her undervisningsprogram til børn og unge for børn og unge.

Interviewer1: [00:38] Det var bare lige for at have en god start. Og så hvad er din rolle inden for strøm til børn eller strøm?

Speaker: [00:45] Jeg har rollen som den, der står for. Jeg er overordnet ansvarlig for al undervisning, som vi laver, uanset om det er workshops, som det er skoleforløb, om det er opkvalificering, kurser for lærere, så det er dem, der står for indholdet, der er ansvarlig for indholdet. Og så er jeg projektansvarlig i den forstand, at det er mig, der sidder med budgetterne og økonomien og prøver at få tingene til at hænge sammen og laver strategien, så vi kan nå så langt som muligt med projektet og udvikle i forhold til tanker omkring, hvor vil vi gerne hen, og hvordan kommer vi derhen. Og det er også mig der tager mig af samarbejdet, som vi også laver mange af på kryds og tværs. Jeg koordinere, når vi skal ud og laver forløbene de forskellige steder, så er det mig, der kontakter skolerne eller tager imod de skoler, der kontakter mig og koordinerer, hvornår vi skal, hvornår vi skal komme de forskellige steder. Så er det mig, der uddanner underviserne. De har selvfølgelig noget uddannelse allerede når de kommer her hos os, men at blive uddannet til specifikt at kunne varetage den undervisning, som strøm til børn er. Der er det mig. Der klæder dem på til den opgave og sørge for at give dem supervision undervejs og støtter dem undervejs.

Interviewer1: [01:56] Så har vi allerede videre til en redegørelse her. Hvis du skal sige Hvad er processen? Hvad laver I helt konkret i strøm til børn? Hvad ville du så sige?

Speaker: [02:06] Jeg vil sige, at overordnet set fokuserer vi på tre aktiviteter. Den ene aktivitet er de her strøm til børn, skoleforløb, som vi laver ude i folkeskolen for fjerde til sjette klassetrin, som er tre dags forløb. Så laver vi opkvalificering, kurser for musiklærere og pædagoger og andre interesserede. Ofte kombineret med det der skoleforløb, når vi er ude. Men vi laver også opkvalificeringskurser uden at der er et skoleforløb i forvejen. Og så laver vi sidste del workshops i forbindelse med festivaller eller større arrangementer, hvor man kan booke os ind til eller hvor vi måske har et samarbejde med den pågældende festival eller organisation, og hvor vi så står for en eller anden form for workshop, hvor der kan komme folk og få en smagsprøve på de metoder vi arbejder med. Så det laver vi forskellige steder. Så det er overordnet det vi laver, sådan helt lavpraktisk.

Interviewer1: [02:56] Jeg tror lidt inden for det interview, at nok med sit fokus på det med folkeskolerne. Så når jeg snakker om de næste spørgsmål, så er det nok helst fokus på dem,

så vi står side igen. Men så kan man spørge i forhold til det med de her folkeskoler, hvad er det så gerne, I vil opnå mere intensivt?

Speaker: [03:14] Vi vil først og fremmest gerne opnå, at Børn og unge oplever, at musik er mere end reproduktion. Vi vil gerne vise dem, at musik er andet end at spille noget, som alle andre siger, de skal spille. At musik også er noget, man skaber selv. At musik er noget, man kan bruge til at udtrykke sig med. Det er vores hovedfokus, og vores instrument er så det digitale instrument. Men vores hovedfokus er helt klart at give børn og unge en oplevelse af og nogle succesoplevelser med selv at skabe deres eget . Hvor elementet det er lyd.

Interviewer1: [03:51] lige stil til det andet spørgsmål. Ja, det lyder meget som det. For det andet spørgsmål Hvad er jeres mål med strøm til børn?

Speaker: [03:56] Og det hænger jo ligesom sammen, kan man sige. Vores mål er netop at give dem nogle succesoplevelser med at skabe deres eget, men også give dem en fornemmelse af, at de kan skabe. Det giver dem lyst og inspiration til selv at skabe noget med lyd, selv skabe musik og give dem en mestringsfølelser omkring det . Så det er ikke bare de tre dage, vi er der ude, så får de en fed oplevelse. Og ja, det var fedt. Og så fortsætter hverdagen. Det er enormt vigtigt for os, at vi får lavet vores undervisning sådan at de efterfølgende sidder med nogle metoder, som de kan bruge. Og når vi tager afsted igen, så er det enormt vigtigt i forhold til det. Og så. Det her med at de netop. Opdager, at det er særligt det her med, at de opdager, at kreativitet er noget de har allerede. At det er noget de kan allerede.

Interviewer1: [04:50] Så er det jo lidt ondt spørgsmål, jeg ved ikke om du så det spørgsmål. Men har I noget data om dette med jeres mål? Det var lidt en længere forståelse med om der er noget af det. i overhoved må vise. Man kan se, at der har været stor succes med det?

Speaker: [05:03] Den måde, vi måler på, om vi har en succes, er, at vi lykkes med de ting, vi har sat os for, er, at vi efter hvert forløb, vi lavede ude på skolerne næsten efter hvert forløb, der giver børn os en udtalelse. Altså en feedback, hvor vi spørger dem efter. Hvad synes I? Hvordan synes I det her forløb var, og hvad skal vi fortsætte med? Hvad synes I, at vi skal stoppe med at gøre, så vi får nogle ret ærlige tilkendegivelser fra dem? Skriftlige tilkendegivelser omkring, hvad de synes om de forskellige ting eller hvad de synes om vores forløb og de feedback og evaluerering vi får fra dem. Dem justerer vi selvfølgelig efter. Dem læser vi og tager meget alvorligt og har justeret projektet efter. det ligesom den kvalitative data indsamling vi har, og kvalitetsmæssigt skal de også give nogle stjerner. Og de skal være

ærlige Hvad skal vi bruge det til noget? Så det er ikke noget med at de bare skal glæde os med at give os 4 ud af 4 stjerner. Det skal være sådan, at de virkelig er ærlige, og det får de også ved at de kan give os 4 stjerner, hvis de synes, at det har været meget godt. Tre stjerner, hvis det havde været godt, to stjerner, hvis det har været mindre godt og 1 stjerne hvis der været dårligt. Og det er helt bevidst, at man ikke kan give 5 op til 5, men kunne give fire, så de virkelig bliver nødt til at tage stilling og ikke bare placere sig i den sikre midter zone. Og der har vi selvfølgelig samlet sammen igennem de år vi har arbejdet med det og de op vi har fået de data fra dem er der 95 procent som svarer 3 eller 4 stjerner af børnene, så det tager vi som et succeskriterie. Men vi kigger selvfølgelig også på dem som synes de får, og som samtidig siger at de ikke har brudt sig om det. Og det kan der være forskellige grunde til, men det er som sagt meget, meget få. Men selvfølgelig forholder vi os også til det.

Interviewer1: [06:52] Så er det jo med lidt det samme spørgsmål. Så hvis I allerede har opnået disse mål og hvis ja, hvordan?

Speaker: [07:01] Ja, det synes jeg vi har. Men vi er også et dynamisk projekt i den forstand, at vi hele tiden forholder os til hvad er behovet? Altså, vi laver ikke det her for vores egen skyld. Vi laver det her for børnenes skyld, Så vi kigger hele tiden på, hvad er behovet? Og det er også derfor, vi involvere folkeskolelærerne og musiklærerne har et opkvalificering kursus med dem. Det er vigtigt, det her er noget, der giver mening i deres hverdag. Ellers synes jeg ikke, vi har en berettigelse til at komme der. Og derfor spørger vi også efter lærernes feedback efter forløbet. Også den dansklærer, som måske har været med på sidelinjen, men til at være der, selv om det ikke er musiklærere, der spørger vi efter feedback Hvad ser du, at eleverne har fået ud af det her? Og er der noget, du kunne tænke dig, der var anderledes? Så det gør vi. Vi gør rigtig meget ud af at få stillet de der spørgsmål, Både så vi kan få noget data og noget dokumentation på det, vi laver, og som vi kan give videre til dem, der finansierer projektet, men også så vi har noget at justere efter. Og hvis vi kan se, at der er noget, der er særlig efterspørgsel på, så kan vi. Så kan vi søge penge til eller prøve at udfolde det endnu mere, end vi gør i forvejen. Så projektet er meget dynamisk i den forstand, at vi hele tiden spørger ind til. Fik I noget ud af det her? Ja eller nej? Og hvis ja, hvad fik I ud af det? Hvad skal vi stoppe med, og hvad kan vi fremhæve yderligere? Og hvis der var noget de manglede, så får vi også de ting, med.

Interviewer1: [08:19] Er det okay at jeg lige låner fordi jeg skal lige hurtigt skrive nogen

notater.

Interviewer2: [08:23] Er der nogle tendenser, som især bliver efterspurgt mere?

Speaker: [08:30] Vi kan se, at det der bliver efterspurgt meget, som vi kommer ud med det, er hele det her fokus på selv at skabe. Børnene svarer tilbage. Måske 95 procent af børnene svarer, at de ikke har prøvet at skabe musik selv før . Og vi fokuserer på fjerde til sjette klasse , og der har de altså haft obligatorisk musikundervisningen i nogle år og en tredjedel af læringsmålene i musikfaget det er musikskabelse. Der er musikforståelse og musikudøvelse. Og så er der musik skabelse. Og så det alligevel, så få, der har prøvet at beskæftige sig med det. Og det er ikke fordi, at musiklærerne ikke gider det, men fordi de ikke har fået kompetencerne/mulighederne til det , men at vi så kommer med noget som gør, at de her børn og unge med det samme kan sidde og skabe deres eget musik, selv om de ikke nødvendigvis har gået til musik i forvejen eller troede de havde musikalske kvalifikationer i forvejen. Eller de troede ikke, at de var gode til teknik, så derfor troede de heller ikke, at de ville kunne det her. De får sådan en overraskelse eller en ahaoplevelse hedder det, fordi de opdager netop, at når vi rammesætter på den måde, som vi gør, så kan alle komme i gang. Så hele dette fokus på musik skabelse er enormt vigtigt, og det er det, som bliver talt op af. Eleverne får ejerskab over noget og til sidst sidde med noget, man selv har lavet, og som oven i købet er anderledes end det de andre har lavet. Det er en ultimativ fed oplevelse.

Interviewer1: [09:58] Så kan man faktisk allerede spørge det. Nu snakker vi så meget om det, men omkring med børn? Hvorfor har jeg så valgt børn som målgruppe til 4. Til syvende klasse.

Speaker: [10:05] 4-6 klasse har vi valgt helt specifikt, fordi det de sidste to år i folkeskolen, hvor de har, hvor de har musik som obligatorisk fag. Jeg har valgt folkeskolen, og vi har valgt at fokusere på folkeskolen, fordi der møder vi alle børn, og jeg har tidligere uddannet sangere, og jeg har været musikskolelærer i mange år og på musikskoler. Der kommer der kun én type. Hvis man kan sige sådan. Der kommer nogle fra ressourcestærke familier, hvor de har råd til at betale for den samme undervisning hos Jeanette en gang om ugen, og det er én bestemt. Det er en lukket klub, hvis man kan sige sådan. Musikskolerne. Men ude i folkeskolen sidder alle, og det er det, der er så fedt ved det her projekt. De får heller ikke lov til at vælge inden, om de har lyst til. Lærerne må ikke udvælge de mest interesserede fra en årgang, som vi så kommer og laver et Strøm til Børn-forløb for. Jeg vil hellere nå dem, der

ikke troede, det her var noget for dem. Så derfor er det vigtigt, vi kommer ud steder, hvor undervisning er obligatorisk. For vores primære opgave er at inspirere. Også nogle af dem, der troede musik ikke var noget for dem. Og det er jo lidt sjovt, når de siger musik ikke er noget for dem, fordi mange børn. Næsten alle børn, 99 procent af alle børn lytter meget til musik eller har lyttet meget til musik. Så musik er noget for næsten alle, kan man sige. Så derfor er det også fedt at vis alle, hvor de ikke selv har valgt at de skal være i lokalet, at vi kan guide dem til hvordan vi kan skabe musik selv hvis de ikke i forvejen har prøvet dette. Så folkeskolen er på grund af det demokratiske, at vi støder på alle børn.

Interviewer1: [11:45] Kan vi hurtigt tjekke om den optager. Jeg prøvet et interview, hvor den stoppede. Ja, det gør den. Det tager vi efter. Jeg har nemlig nogle spørgsmål, der omhandler noget data. Kan vi bare tage, fordi det er rart med noget praktisk. Så er der et spørgsmål her. Hej med video og data eller andet fra da jeg var ude og teste. Det tager jeg også bagefter, fordi.

Speaker: [12:11] Ja Det er op til jer.

Interviewer1: [12:14] Den tager vi også efter. Og du har lige sagt hvad der er et spørgsmål der hedder hvem er det, i prøver at havde indflydelse på er det en specifik gruppe det har du nærmest lige.

Speaker: [12:23] Ja, men det vil jeg faktisk gerne uddybe, hvis det er fordi ja, det vi gerne vil, og det er hvad vi kan se, at vi har særlig succes, det er, at når vi laver det her projekt, så fortæller lærerne os efterfølgende, at det er nogle andre børn i klassen, som får succesoplevelser, end de plejer at opleve i folkeskolen. Og det synes jeg er ret relevant. Og det er en af de bevæggrunde, som gør, at vi virkelig sørger for at komme så vidt ud som muligt, som et musikprojekt, og derfor prøver vi også at komme på skoler, hvor de ikke nødvendigvis har høj trivsel. Nogle musiklærere vil gerne give forløbet til den gode og velfungerende klasse, og ikke den klasse hvor der er trivselsudfordringer. Vi vil meget gerne undervise i de klasser der har udfordringer. Her der ligesom fokus på et individuelt udtryk, så derfor kan alle være med. Der er ikke noget bestemt facit, man laver ligesom sit eget facit. Der er ikke rigtigt og forkert. Det betyder selvfølgelig ikke, at alt bare er skide godt. Vi guider selvfølgelig den der kreative proces, men det, som lærerne oplever, at vi også oplever, er, at børn, som normalt ikke klarer sig særlig godt i skolen eller måske ikke er så hurtige til at løse opgaver normalt, eller som ikke er gode til at læse eller regne, eller gode til at løse opgaver på normal vis i skolen. De

får en succesoplevelse her både i sit eget felt, hvis man kan sige sådan for sig selv, men også i forhold til at de får anerkendelse fra kammeraterne. Selv om de sidder og arbejder med deres egen musik. Så er der stadig fokus på at de deler både proces og produktet med hinanden. Så de får også en anden anerkendelse og position i klassen efter sådan et projekt. Så det er også en af grundene til at vi har valgt folkeskolen. Det er fordi, at vi kan nå nogle steder hen til nogle børn, som ikke får de her succesoplevelser.

Interviewer1: [14:10] Det var faktisk rigtig godt, det lige netop det vi skal få data på. Så kom jeg videre til nogle spørgsmål, der handler om viden, så hvis du skal sige den der svare på du vil måske gerne lige have helt konkret: Hvad er den langsigtede udvikling I håber at få set i de her børn fra de her initiativer, I laver?

Speaker: [14:31] Vi håber, og det taler vi meget om. Vi håber, at at vi får givet børnene en erfaring ud i, at de kan selv skabe musik, at de fortsat, at det er noget de kan, og at de allerede er kreative. At det er ikke noget, der er forundt nogle, og at med en bestemt tilgang med nogle bestemte strategier og en bestemt teknik, så kan de også skabe deres egen musik. Vi håber, at vi giver dem, eller vi forsøger at nå dertil, hvor de får den erfaring, at musik er meget mere, end de troede. At musik er en måde at udtrykke sig på, og den håber vi, at der bliver hos dem. Vores udfordring er selvfølgelig, at vi tager derfra igen. Og ret hurtigt, så mangler de ny inspiration. Det er ikke sådan, at de bare kan komponere musik for evigt ud fra de tre dages undervisning, vi har givet dem, og det da kan være svært for os, at vi så efterlader dem, og vi ved, at de går hjem og fortsætter, hvad mange siger, de har lyst til, så ved vi, de kommer til at mangle flere input og mere inspiration på et tidspunkt, hvor vi så er taget videre til et andet sted.

Interviewer3: [15:42] Der siger mere om hvorfor det er så vigtigt, at det er at skabe musik som hva, hvorfor er så vigtigt?

Speaker: [15:49] Ja. Og det er faktisk rigtig glad for, at du spørger, det her med at skabe er vigtigt, fordi der når man skaber noget, så får man et ejerskab, og der er lavet masser af undersøgelser omkring hvad er det, hvad børn synes er interessant i skolen? Hvornår er det de føler sig motiverede til at gå ind på skolen? Hvornår de føler, at musikundervisning eller undervisning i det hele taget er interessant. Og det er når de får noget medbestemmelse og noget ejerskab og selvfølgelig også nogle succesoplevelser. Men medbestemmelse og ejerskab er enormt vigtigt. Og så også det her med at få lov til at skabe noget originalt. Og dermed

mener jeg ikke, at vi skal opdrage alle vores børn og unge til at blive nogle små individer, som kun har fokus på sig selv. Men for at kunne indgå i et fællesskab er det enormt vigtigt, at man også ved, hvad man selv kan, og hvad ens eget udtryk er. Så det er vigtigt, at vi som voksne i de her børne miljøer, som en skole jo er, faciliteter de her kreative processer, så de får den oplevelse, Det her er særligt ved mig. Eller det her det er noget der er unikt ved mig. Og de får de oplevelser med at kunne udtrykke sig og kan skabe et unikt udtryk så er det med til at stimulere det gode fællesskab, fordi man så også kan se, hov vi er jo ikke ens. Og det her, det handler ikke om at være god eller dårlig, når vi udtrykker os.

Speaker: [17:06] Det handler om at lære hinanden bedre at kende eller forstå hinanden bedre, forstå forskellighederne. Og èt, der er lavet masser af forskning på det. At det er vigtigt det her med medbestemmelse og i og derfor at det er kreativitet og interessant, så børn også selv sagt. Der er nogle undersøgelser i forhold til hvad det er børnene synes der er fedt. ved billedkunst og håndværk og design og også madkundskab for den sags skyld. Og det er, at de får lavet noget konkret. De står med noget til sidst, som de bliver stolte af, og den fornemmelse kender vi alle sammen, uanset hvor rædsomt det her, den her bordskåner eller hvad man nu har lavet i træ den er, eller det her skilt, man selv har siddet der brændt. Men det her ejerskab, at man har lagt noget i det, det, det er bare så særligt. Og der har nogle børn sagt i nogle interviews, at noget af det, som de mangler til hverdag i deres musikundervisning, er netop at få den ejerskab fornemmelse med ind. Så derfor synes jeg, at vi skylder dem at have flere projekter a la strøm til børn, men også andre kreative musikprojekter, hvor de finder ud af, at det at skabe musik, det har de allerede kompetencerne til, fordi de har lyttet så meget som de har. At det handler om, at vi kommer ud og faciliterer det, så de kan komme i gang med deres egen kreative proces.

Interviewer1: [18:19] Ja, det var faktisk et spørgsmål, der lige blev dækket der. Så er der et konkret en her. Kan det, Kan I dele nogle succeshistorier eller markante oplevelser, hvor I tydelig har set en positiv indvirkning på jeres program for børns musikalske udvikling og glæde?

Speaker: [18:37] Ja, der er to ting, der i forhold til du ser både musikalsk udvikling og også glæde, for det er jo to forskellige ting. Og så alligevel ikke. Fordi musikalsk udvikling, hvornår er noget en musikalsk udvikling, og hvornår er det.

Interviewer1: [18:49] Det var måske lidt dårligt formulerede

Speaker: [18:50] Nej, nej, overhovedet ikke en dårlig formulering, for det er egentlig bare. Det jo igen at kigge på, hvad er det, man gerne vil have ud af det her. Vil man gerne have masser af nye musikere? Er det det vi vil ud og lave? Er vi ude og lave nogle, som kan komme til at leve af musik, altså fremme talentmassen og sørge for, at der kommer en masse nye talenter, så kommer en masse nye stjerner. Er det det som er vores fokus? er vores fokus trivsel, at flere finder ud af, at musik er en måde at udtrykke sig på og finder ud af, at det kan de også bruge, også selvom de ikke står på en scene, men kan bruge det. Man kan lave musik til sig selv, eller man kan lave musik bare for sin egen skyld, at det også er okay. Og jeg synes, det er vigtigt, at man hele tiden er bevidst om, der er begge dele, og vores mål er ikke som sådan at få gjort dem til musikere. Vores mål er, at også den introverte dreng, som næsten aldrig siger noget i klassen, finder ud af, at det at lave musik for sig selv kan noget helt særligt, og at han ikke behøver komme op på en stor scene og vise det til forårskoncerten.

Speaker: [19:47] Og at det ikke behøver at brage ud af den store højtaler, men at det kan være en måde at udtrykke os på. Og når vi ligesom fokusere på den del, altså på glæde, trivsel, det den brede deltagelse i musik, så vil der jo også helt naturligt komme flere talenter, fordi der ligesom er en større masse.

Interviewer1: [20:02] Men det ikke målet?

Speaker:[20:03] Det ikke målet, ogi forhold til, som vi har set nogle markante oplevelser eller succeshistorier. Altså vi får mange succesoplevelser. Faktisk. Næsten hver gang vi er ude, får vi nogle succesoplevelser. Det kan være noget af det, børn siger, for det er jo det, der ligesom er vores indikator. Ligesom indikatoren for, om det virker, det vi gør. Så når børnene fortæller, at. At de opdager hvad musik, kan det for mig eller få os en succesoplevelse. For eksempel var vi ude i en fjerde klasse. Jeg tror, det var på Frederiksberg, hvor der var en dreng, som - og vi kom ind i klassen - da vi var der i tre dage, og vi var der så her den første dag. Og da vi præsenterede forløbet og stod, så var der flere, der sagde Ohh ja, der er der nogle der er vildt dygtige.

Speaker: [20:50] Vi ved bare ham der. Han er mega god til musik, så han kommer bare til at woow. Og det var tydeligt at mærke at der var sådan et A og B-hold stemning. Altså de havde lyst til allerede at udpege hos hinanden, hvem der ender med at være gode til det her. Ikke så meget hvem er knap så gode, men alligevel så får man jo lavet en eller anden form for hierarki, og det er jo det, vi gerne. Det vil vi gerne udenom. Men altså, vi var bare sådan.

Det er ikke det, det kommer til at handle om. I kommer til at opdage, at det kommer ikke til at handle om at være god, bedre eller bedst. Og det kan vi godt stå og sige. Og man kan godt mærke, det fes bare hen over hovedet på dem. Men så senere, tre timer senere, da de sad og var ved at spille nogle beats for hinanden, som de har lavet i en trommemaskine hver især. Og de begynder at lytte til hinandens. Og de var vildt spændte på at høre hinandens, og selvfølgelig også nervøse for at afspille deres eget. For nu var der pludselig noget på spil, når det er noget, man selv har lavet.

Speaker: [21:42] Og da de så hørte hinandens, så var det så sjovt. Der var der nemlig en dreng, der reagerede ved at sige, at NU forstod han, hvad det var, det handlede om. Det handler jo slet ikke om hvorvidt nogle er gode eller dårlige. Vi lærer hinanden bedre at kende, og det synes jeg, at en 10 årige knægt i folkeskolen kan fange dem på tre timer, altså selv erkende. nååh det dét, det handler om. Det synes jeg er fedt, og det er det, der ligesom er vores mål. Det er at nå frem til det der er at de kan se det, det handler om. Det er, at vi viser noget af os selv. Det handler ikke om at blive gode eller blive klappet af eller få lipgloss på eller udgive noget på en youtubekanal eller komme med i X-faktor. Det er ikke piedestalen, vi går efter. Det er processen og det at vise, hvem vi er over for hinanden, så vi får en bedre forståelse for hinanden. Og så er det her bare endnu et udtryksmiddel. Dans er også en måde at udtrykke sig på, og tegne er også en måde at udtrykke sig på. Graffiti er pgså en måde at udtrykke sig på. Mange måder at udtrykke sig på. Men musik, det har de ikke prøvet før.

Interviewer1: [22:38] Ja, det var et virkelig godt quote. Det tror jeg også, vi kan bruge det der med den der dreng til det selv, hvis vi må.

Speaker: [22:46] Vi har også, det kan måske være meget fedt, for jeg får en ting er hvad jeg sidder og siger, at de andre har sagt. Vi har jo en masse data liggende i forhold til børnenes udtalelser. Jeg har bare lige her til i dag allerede printet èt her, så ikan se hvad det er. Både børnene og lærerne udtaler, for det er jo meget data jeg ser.

Interviewer1: [23:05] Jeg tænker vi kunne gøre det efter interviewet her.

Speaker: [23:07] Lad os endelig gøre det, for der kan i også se hvad er. Hvad mener jeg, når jeg siger, at vi lytter til, hvad de siger og udfolder det yderligere? Det giver mening, når man kan læse sig til.

Interviewer1: [23:18] Jamen, vi går bare igennem. Der er stadig nogle tilbage her. Nu kommer vi lidt ind til det tekniske, på hvilken måde og anvender strøm til børn teknologi til at fremme musikalsk kreativitet blandt børn.

Speaker: [23:34] Vi bruger det som et musikinstrument, Det vil sige, vi kigger på det teknologiske, ikke som et quickfix eller en hurtigere måde. Eller det er fedt, fordi det er en skærm, og alle børn elsker jo skærme. Sådan er det ikke. Det er heller ikke et ja, en iPad projekt er det heller ikke. Vi bruger det instrument eller bruger computer og tablets som lydgiver, ligesom vi vil bruge andre instrumenter. Men det, der er fordelen ved det digitale, er, at der er så mange facetter og så mange kreative muligheder i forhold til lyd, når vi snakker det digitale. Og det er netop og det er netop det, der gør, at for os er det et instrument, hvor vi kan få børnene til at være kreative på ret hurtigt. Men igen, det er ikke fordi det er at hoppe over, hvor gærdet er lavest. Slet ikke. Tværtimod, så er det ikke bare programmerne, som gør det her for os. Og ja, der eksisterer masser af programmer, musikprogrammer, hvor at det er ret nemt at bygge sit eget musik. Altså hvor er det bare legoklodser man sætter oven på hinanden, og så lyder det godt med det samme. Men vi ved også, at når man når børn sidder og arbejder med det og sætter oven på hinanden, så er mestringsfølelsen ikke særlig stor og succes oplevelsen ikke særlig stor. For de ved, at det kunne enhver have gjort, fordi programmet har jo selv synkroniseret beatet, og de har selv synkroniseret tonearten, så jeg har jo ikke haft nogen indflydelse, jeg har ikke engang skulle lyt til noget, jeg ikke skulle sanse noget bevidst overhovedet.

Speaker: [24:57] Det er bare noget programmet selv har gjort. Vi undgår alt, hvor vi kan se, de ikke behøver at lytte. Vores indgangsvinkel til alt, når de sidder i Kreativ det, er, at de skal sanse bevidst. De skal lytte bevidst og så træffe et valg. Og med den med den strategi der kan man ikke bare lige når ja, men så fikser den det jo for mig. Så kan man ikke gå den vej. Pludselig også når de sidder og har skabt nogle forskellige ting, så kan. Så kan de fortælle os og også deres kammerater om, hvorfor de har taget de valg, de har taget, fordi de faktisk aktivt har taget stilling til det. Og det er den aktive del, jeg synes, der er kernen og den aller allervigtigste. Jeg har set mange digitale kreativitets projekter, hvor det nemt bliver woow hvor det et fedt program og prøv at se hvad det kan, og så gør det bare lide det, og så kan den selv gøre det og så kan man også gøre det. Men så er der ikke længere så stor fokus på, hvad hvordan du udtrykker dig, men mere nu har vi bygget et fedt hus, som er noget musik, men så er det mere det, det kommer til at handle om. Og det er også mega fedt. Men det er

ikke det vi har fokus på og derfor Kalder vi det ikke et kursus i musikproduktion , fordi det tit er det man forventer er musikproduktion. Det er den der lagkage bygning, hvor man bygger beats på den måde. Det er ikke det, der er vores fokus.

Interviewer1: [26:15] Hvad vil du kalde det?.

Speaker: [26:16] Jeg vil kalde den bedste måde at udtrykke det på digital kreativitet. Jeg fokuserer på musik skabelse på digitale instrumenter, så det er ligesom ad den vej rundt. Det er ligesom musik skabelsen, for i musik skabelsen, så ligger der det, at vi skal sanse noget lyd. Men instrumenterne, det er de digitale og fordelen også ved det digitale og det i høj grad også derfor, at vi bruger dem, det er, at alle har en fair chance. Når vi tager 30 iPads med ind i klassen, så er alle i samme båd. Alle er lige. så kan man så sige, jamen der er nogen der har prøvet at lege med GarageBand før, eller har prøvet nogle af de apps før som vi er inde i. Men fordi at vi skærer det på en bestemt måde og framer undervisningen på en bestemt måde og den vej de skal gå på en bestemt måde, så er alle lige for ingen har prøvet præcis dèn vej før, så alle står lige med den samme aktivitet og står på samme niveau. Og der synes jeg, at det digitale er noget af det mest demokratiske vi har lige nu, fordi at skolerne uddeler jo skolecomputer til alle, så næsten alle børn har adgang enten til en iPad derhjemme eller en skole computer, og hvis de ikke har det hjemme eller ikke får deres skole computer med hjem, så har de helt sikkert på deres fritidshjem eller i deres klub. Så det er simpelthen det mest taknemmelige instrument lige nu, fordi det ikke kun er for dem, der har penge eller dem der i forvejen har en musikkultur derhjemme.

Part 2:

[00:00] Interviewer1: Man kan lige spørge det her. Det er nemlig det næste spørgsmål. Hvorfor synes i det er vigtigt at give børn muligheden for musik gennem teknologiske værktøjer? Ikke analog?

[00:10] Speaker: Jeg synes, det er vigtigt at præsentere dem for lyd. Jeg synes ikke, det er vigtigt, at det digitale kommer til at overtage, og jeg gør meget ud af at sige, når jeg er ude i klasserne, men også når jeg har kurser for lærerne, at det kun er en medspiller. Jeg er selv sanger, og jeg spiller klaver. Det er meget analogt, og jeg elsker også keyboards. Jeg er blevet så fuldstændig vild med trommemaskiner, når jeg komponerer musik. Jeg synes trommemaskinen er genial. Men det er bare en medspiller. Det handler ikke så meget om, at jeg vil at det her instrument skal overtage de andre instrumenter i musiklokalet, men jeg

synes, at med det digitale kan jeg skabe en port, hvor de kan komme ind i musikkens verden. Plus at meget af det musik, de så, kommer til at sidde og producere med synthesizer, bass for eksempel og trommemaskiner minder meget om det musik, de hører i forvejen. Der er flere børn, der lytter til musik med synth bas end med traditionel elbas. Så derfor, og det er ikke for at sige, at det musik er bedre, men jeg synes det er en god ide, at man guider dem hen et sted, hvor der er noget velkendt, fordi det føles trygt, og så kan man altid vise dem nogle andre ting.

[01:15] Speaker: Men jeg mener ikke, at de skal blive i det her. Jeg mener ikke, at alt musikundervisningen skal erstattes af det her. Jeg mener, at de digitale instrumenter skal være en del af undervisnings programmet, ligesom der også er trommesæt og guitarer og andre strengeinstrumenter og blæseinstrumenter. Det er en lydgiver på samme måde, eller som skal have den samme den samme plads i hierarkiet som de andre ting, den må ikke overtage. Men en anden ting, som også er fordelen ved de digitale, det er i forhold til det her med at skabe noget. Når man skaber sit eget musik på et klaver, så forsvinder musikken med det samme. Hvis jeg laver en lille melodi, som går et eller andet sted hen, så er den væk med det samme, fordi den er overstået. Men med digital kan man køre i de her loops, altså sekvenser hvor den har indspillet det allerede med det samme. Så det kører rent, og jeg kan nemt rykke på melodien, fordi det midi, så jeg kan nemt flytte på en tone, og sige hov, det skal ikke være den tone, der skal være en tone over, lytte igennem. Nej, den skal heller ikke vare længere, jamen så kan jeg gøre den lidt længere og lytte igen. Så de her sekvenser-muligheder, som der er indbygget i alle trommemaskiner, gør, at man har en helt anden mulighed for at kunne skabe musik, fordi den er med til at fastholde musikken.

[02:28] Speaker: Så du får hele tiden ny chance for at justere. Selv om du ikke kan huske præcis, hvad det var, du spillede før, hvor. Hvis du sidder og komponerer et stykke musik på et klaver, så bliver du nødt til enten at skrive ned hva var det lige jeg fandt på eller optag hvad var det lige jeg fandt på at høre det igen for at kunne bygge videre. Og det kan faktisk være enormt bremsende. Særligt hvis man ikke har et koncentrationsniveau, som rækker til et kvarter, hvad der jo mange børn der ikke har, Så er det meget federe at sidde og arbejde i en sequencer, hvor man stille og roligt kan justere og tage tilvalg og fravalg for at bygge sit eget. Og så kan man jo efterfølgende tage det, man har bygget i den trommemaskine. Om det er en melodi eller nogle akkorder, der endte med at blive en harmoni, eller om det er en rytme, så kan man efterfølgende overføre det til nogle af de andre instrumenter. Så derfor er

der nogle klare fordele ved dette instrument. Men det må aldrig udelukke eller overtage for de andre instrumenter, og det er en fed medspiller.

[03:29] Interviewer1: Der var nemlig et spørgsmål, du nogenlunde svarede på, så kan vi hoppe videre til det næste her. Hvor meget synes du selv, at Det er lidt et vagt spørgsmål, og det er jo nok også din personlige holdning frem for en objektiv mening. Jeg vil meget, synes du selv. Der er fri leg, og hvor meget synes du, der er guidet i forhold til det i den proces?

[03:49] Speaker: Det er vi faktisk meget bevidste om og har nogle helt klare rammer omkring. Fordi når vi sætter en ramme og siger nu skal I gå ind her, så skal i gøre sådan og sådan. Det er jo ikke fri leg, så derfor har vi også lagt fri leg ind i programmet, hvor vi viser dem en metode og når vi viser dem den metode, så er det jo nærmest som en opskrift. Ligesom en bygge opskrift til at bygge et hus eller en strikkeopskrift. Og med den opskrift kan man jo sige at de har ikke fri leg, så er det jo ikke særlig kreativt. Men jo, det er det stadigvæk, fordi vi skal tage nogle individuelle fravalg og tilvalg undervejs i processen, så vi ikke bygget det samme hus, et ens hus. Men jeg kan garantere de kommer i mål med noget, og det er jo også mit ansvar, at de kommer i mål med noget, fordi vi ved, at det fremmer deres succesoplevelser, mestringsfølelser, hvis de faktisk står med noget til sidst, som de synes der fungerer. Og det kan jeg guide med, via en opskrift, men en opskrift er der jo ikke fri leg, så derfor laver vi det også sådan, at nu fortæller de nogle ting de skal afprøve og gå igennem inde i en bestemt app, og så får de efterfølgende lov til at oprette nyt nummer i samme app, hvor de får lov til at eksperimentere, og hvor der er fri leg.

[04:54] Speaker: Og vi gør meget opmærksom på, at der er begge dele, fordi nogle vil så gerne over i fri leg med det samme. Og hvis vi sender dem over i fri leg med det samme eller som det første, så kan vi se, at der er rigtig mange, der mister motivationen i løbet af 5 minutter. Fri leg gør bare at energien, at de har udtømt alt hvad de troede der var muligt i løbet af ganske kort tid. Men hvis vi for eksempel har givet dem en struktur til at begynde med, og hvor de har set nogle features, som de aldrig var stødt på, hvis de havde haft fri leg fra starten af, så kan de tage de features med over og udforske nogle flere ting i fri leg. Så for os der tager vi for vores point of view er det meget at forholde os til. Hvornår har vi sat en ramme, som de skal følge, og hvornår skal de ikke følge rammen, men selv undersøge, Fordi begge dele er vigtigt? Og det er også noget af det, som jeg underviser folkeskolelærerne ind,

at de skal lave.

[05:41] Speaker: Det er enormt vigtigt, at man ikke siger, at fri leg er forbudt. Du må ikke gå ind der. Anerkend, at de har en nysgerrighed over for udforskning. Det er jo mega fedt. Vi vil gerne have nogle børn, der er ivrige og nysgerrige. Selvfølgelig kan det være irriterende, når man som lærer prøver at forklare noget, at de kommer til at slette det hele fordi de lige skal undersøge eller teste andre knapper undervejs. Men det er min opgave at anerkende, at de er både nysgerrige og ivrige. Da er det min opskrift, vi skal følge for at komme igennem junglen hen til den her iskiosk, og det er min opgave at hjælpe jer igennem det. Efterfølgende der får jeg også oprettet et andet nummer, hvor I får lov til at go nuts, og så kan det ligesom skabe ro omkring det vi så i gang med lige der, for de ved, at det er ikke forkert det andet. Det er ikke noget med, at de skal sidde og luske sig til at lege inden programmet ved at det er noget der bliver prioriteret senere.

[06:39] Interviewer1: Hvad jeres erfaringer med Opmuntre børn til at eksperimentere og tage risikoen eller risici i deres musikalske skabelsesproces.

[06:57] Speaker: Vores erfaring er, at for nogle mennesker og nu siger jeg mennesker fordi det er fuldstændig ligegyldigt hvilken alder man har. Men for nogle mennesker er det nemt at kaste sig ud i og bare forsøge noget, og for andre mennesker der kan det være enormt angstprovokerende og sidder for blankt stykke papir for at vide nu skal du skrive en fed historie. Så derfor er min erfaring, at jo bedre vi bliver til at guide dem til at få taget de første skridt, så de glemmer, at der er noget på spil, jo nemmere er det også for dem at være kreative. Og det er den teknik eller den metode, som vi bruger rigtig meget tid på i strøm til børn. Det er proces metode metoder omkring den kreative proces, og vi har sådan en to fase modellen, som jeg udviklede og som vi arbejder efter, og som jeg skal give jer, som jeg har skrevet ned, som jeg kan give jer, hvis interesseret i den. Og to Fase metoden er egentlig en metode, som jeg har samlet af alle mulige andre designmetoder. Jeg har bare forenklet den rigtig meget ved at man faktisk kommer i gang, for det er jo det, det handler om, er, at man kommer i gang. Og to fase metoden går ud på, at man har ét, som er idegenerering, og man har fase to, som er justering, og man må aldrig sætte sig lige midt imellem de to faser. Man skal ligesom være et af stederne. Så fase 1 idegenerering må man ikke begynde at vurdere en masse af det, man har lavet. Det kan for eksempel være, at man skal starte noget tilfældigt. Det kan være, at man skal starte med at lukke øjnene og trykke sådan her

på en trommemaskine, og det betyder ikke, at det lyder godt. Men så går man over i fase to bagefter og begynder at lytte og justere.

[08:37] Speaker: Hvad fungerer? Hvad fungerer ikke? Hvordan lyder det? Slette det, der lyder dårligt og bygge videre på det der lyder godt. Så begynder man at justere. Det der er problemet ved mange kreative processer, når man siger til børn nu skal I bare kaste jer ud i det. Det er, at de sætter sig lige mellem fase 1 og 2. Jeg kan ikke komme igang, det lyder bare lort det hele eller gør et eller andet og sletter igen eller sletter igen. Sletter hele tiden krøl, ligesom når man krøller papiret sammen. De slår hele tiden sig selv hjem i ludo og det kan jeg godt forstå, for jeg er selv samme type. Jeg er selv sådan en, der rigtig gerne vil lave noget, der er fedt, så derfor synes jeg det er svært at komme i gang med det. Der er det vores opgave med den her 2 fase metode og få dem i gang uden de selv opdager, at nu er de faktisk i gang, så de slipper for at skulle prøve at vælte den der mur slipper for at stå. Vi siger aldrig til børnene I skal bare prøve, bare kast jer ud i det, da der ikke er noget værre. Mange vil så svare at de ikke forstår opgaven, og det kan jeg godt forstå, at de ikke gør. Og det er egentlig ikke nogen opgave, vi laver med dem. Det er aktiviteter, og det lægger vi også meget vægt på. Når vi præsenterer noget, er det ikke opgaver, de skal lave. Det er en aktivitet, som hjælper dem. Vi laver heller ikke øvelser. Det kalder vi det heller ikke. De får lov til at eksperimentere med forskellige ting og undersøge ting, og det er aktiviteter, vi laver.

[09:55] Interviewer1: Der er nemlig et andet spørgsmål her, der kommer lige efter. Hvordan sikrer I, at teknologien forbliver et værktøj for kreativitet snarere end barrierer på børnene? Og det er så her, du mener den der to fase metoden.

[10:07] Speaker: To fase metoder den ene vej og den anden vej det er sansningen, Jeg har det sådan, at man kan ikke adskille musik og mennesker og med musik og mennesker, men man kan ikke adskille, der skal være, der skal være noget der kommer fra os. Alle ved godt at den med AI, og med computergenereret musik er det selvfølgelig noget andet, og det er der også en masse fede ting i. Men det vi laver her, der er det så vigtigt at børnene eller unge eller voksne eller hvilken alder de sidder med, at de går ind og lytter aktivt til noget, fx hvis det er lavet beats, en trommemaskine, trommemaskiner der er der altid fra starten af lavet eller besluttet et tempo i GarageBand. Der er det tempo 110 der står automatisk. Når børnene så skal ind og justere det beat de har lavet og skal ændre tempoet og undersøge tempoet, så er det enormt vigtigt for mig, at jeg kan se, at de har pulsen i kroppen. For det øjeblik jeg kan

se, de har pulsen i kroppen, så ved at de har lyttet. Hvis de bare har stillet sådan her færdig, så ved jeg, at de ikke de ikke været inde resonere. Så det her med at lytte bevidst, der bruger jeg nogle af de ting jeg ved omkring forankring af musik frem i også mennesker.

[11:21] Speaker: Og det er pulsfornemmelse enormt vigtig. Så er der selvfølgelig noget musik der ikke er puls orienteret og det er jeg med på, og der er det nogle andre ting man kan sætte fokus på for at være sikker på, at man faktisk lytter aktivt. Men det er vores opgave at være opmærksom på, at når vi kigger rundt på 28 børn, der sidder i gang, foregår der kun noget teknologisk, digitalt, eller foregår der også noget sanseligt hos dem? Det står vi og holder øje med, og det kan vi aflæse på forskellige måder. En indsigt man kan se på dem, hvis de sidder og bevæger sig. Så ved vi, at der foregår noget musikalsk aktivt inde i kroppen på dem. En anden måde, vi kan gøre det på, det er at gå rundt og lytte sammen med dem. Vi har sådan nogle splitter, vi sætter i iPad'en, hvor der så er flere, der kan logge ind på samme tid, så de ikke bliver afbrudt, når vi kommer hen og lytter med. Og der lytter vi så med og spørger ind til. Når okay du har valgt den lyd, hvorfor valgt den lyd det ved ikke altid hvorfor, men måske siger de så bare, det fordi jeg godt kan lide den okay har du undersøgt der andre lyde, som minder lidt om den herinde i den her mappe, så skal du bare lige vide.

[12:22] Speaker: Du må gerne holde fast i den, men du kan undersøge de her lyde om og om du synes de bliver federe eller lyden bliver federe eller du hellere vil blive her. Der er også nogle effekter du kan prøve af. Så på den måde kan vi med vores guide som med vores feedback åbne sansningen endnu mere. Så det gør vi meget Ud af, at det her (den digitale teknologi), det forbliver et penalhus, altså et værktøj, og musikken er det centrale. Sansningen bliver det centrale, men det er også derfor, det er sværest at undervise i fordi hvordan uddanner man undervisere til at kunne lytte efter det? Vi har en undervisningsplan, som vi selvfølgelig overordnet kører efter. Men hvis vi kan se, at de sidder bare, og at der ikke er nogen, ikke er nogen sansning, så bliver vi nødt til at afbryde den undervisningsplan og gør noget andet, fordi vores største opgave er at få dem til at sanse noget. Så sætter vi også nogle beats på gulvet, og de får lov til at lave noget efter sang og noget klap, og vi snakker puls og får det overført til computeren og computeren får overført det til kroppen. Så det skruer vi op eller ned for de steder, hvor det er nødvendigt. Så det her ikke bare bliver en facit boks, som bare bliver den, der kommer til at betyde det hele.

[13:39] Interviewer1: Hvor stor rolle spiller det fysiske element? Er der en præference fra

børnenes side?

[13:55] Speaker: Hvad mener du med fysiske elementer?

[14:00] Interviewer2: Altså digitale instrumenter, som i har eller fysiske traditionelle instrumenter.

[14:06] Speaker: Om de bedst kan lide det ene eller andet, eller hvordan de reagerer på det? Altså for mange-for mange er det nyt det at sidde med digitale instrumenter, så der er selvfølgelig en 'wow'-oplevelse i det; Hov, man kan godt være sådan. Men noget af det, som er enormt vigtigt, når man bruger et instrument, er jo, at man- det der ligesom er definitionen på et musikinstrument og lydinstrument er jo, at jeg kan gøre noget for at få lyden til at gøre noget bestemt. Så som en guitar eller et klaver eller en harpe, så kan jeg gå ind og gøre noget, som så- lyden gør noget bestemt. Og jo mere intuitivt det er at gå ind i den proces, jo nemmere er det for børn at glemme at de sidder ved en computer og ikke ved et rigtigt instrument. (...) Der var en dreng, som skrev det til mig efterfølgende, at han glemte helt at han sad ved en iPad og følte at det var ligesom et rigtigt instrument, og det er derfor jeg stadigvæk bruger hovedsageligt iPads, når jeg er ude og underviser. Vi har selv kufferter med iPads i, alt udstyret med, også selvom børnene ikke har iPad til skolen efterfølgende. Fordi når de sidder med en touchskærm, som er trykfølsomme og de sidder for eksempel og arbejder med en lyd, og de kan se lyden, den ændrer sig når jeg kører den her vej og den her vej. Så det taktile samarbejder ligesom med kreativiteten og sansningen, og det er så tydeligt at høre i forhold til det, de får lavet. Og fordybelsen er større, når der er touchskærme.

[15:33] Speaker: Det er en anden fordybelse, man oplever, når de sidder og arbejder på computeren. Så man kan se at de bruger mere tid på at udvikle tonerne og lave: Ahh, den skal være sådan, Ahh det skal lige-Der skal det her filter på, Ahh det lød ikke godt, jeg vil den anden vej. Så det her med at have det taktile med, betyder enormt meget. Og det er jo det, det er jo det de fysiske instrumenter kan. Derfor har jeg det også sådan, jeg ved godt at man kan få et klaviatur frem både på computeren og på iPad'en, men hvis man skal spille på et keyboard med sort-hvide tangenter, så synes jeg man skal spille på et keyboard. Jeg synes ikke, at GarageBand eller computeren skal overtage de ting, men vi kan lave nogle sjove lyde benspænd for os selv ved at arbejde med de digitale programmer. Så vi lige pludselig ikke bliver bremset af: Jamen jeg kan jo ikke spille klaver, så jeg kan ikke finde på en melodi på det her klaviatur". Hvis man nu fjerner nogle af tangenterne, så det bare er nogle blokke med

nogle lyde nedenunder, så er de lige pludselig ikke begrænset af; jeg kan ikke spille klaver. Så bliver de nødt til at undersøge, hvad det er for nogle lyde? Hvilken rækkefølge vil jeg have dem have dem spillet i? Og hvordan vil jeg gøre det? Og så får de lige pludselig bygget en melodi uden at kunne spille klaver overhovedet. Og det er min opgave. Det er netop at facilitere, at de ryger ind i den der proces, hvor det handler om lyd og ikke om, om man kan spille klaver.

[16:49] Interviewer1: Godt svar. Så kommer vi faktisk til det sidste. De to sidste spørgsmål og det er, at vi har nemlig i vores projekt har noget med samarbejde at gøre. Hvor vi også gerne vil se hvordan børn også kan få noget udvikling, ud over bare individuel, større interesse for musik og større gavn. Så vil vi også gerne se, muligheden for, som jeg lige sagde, altså at samarbejde skal øge den her interesse, så det er en plus faktor. Så hvor meget samarbejde mellem børnene, når de laver det her musik, eller sidder de individuelt?

[17:20] Speaker: Det er et rigtig godt spørgsmål, og det er noget, som fylder rigtig meget i vores bevidsthed. Vi er der kun i tre dage, og det er begrænset hvad man kan nå på tre da- Man kan også godt nå mange ting. Meget mere end vi kan på en formiddag bare. Men tre dage, når vi sidder med et tre-dages-forløb, så er vi begrænset. Og hvis vi var der bare i fem dage, to dage mere, så vil jeg kunne nå begge dele i endnu højere grad. Det vi prioriterer lige nu det er- eller det vi nedprioriterer lige nu det er samskabelse. Altså de sidder to og to og skaber et projekt sammen. Men når det er sagt, så har vi det stadigvæk med. Jævnfør vores mål fra starten af, så var der det her med, vi vil gerne give dem en succesoplevelse, vi vil gerne give dem en mestringsfølelse af at de selv kan. Vi vil gerne give dem en fornemmelse af, at de kan fortsætte med at skabe musik. Vi vil gerne fodre den her interesse, som vi ved, der muligvis er der et eller andet sted og få sat noget i gang hos dem hver især. Tidligere, før strøm til børn blev den- i det format vi har nu, der lavede vi sådan, at børnene arbejdede sammen. De arbejdede ikke alene, de arbejdede sammen i grupper af to, tre eller fire, og det jeg så næsten hver eneste gang. Det var, at der altid var én i gruppen, som fik mestring følelsen, og det var den, der var leder.

[18:43] Speaker: Det var den, der var hurtigst til at tage tilvalg eller fravalg. Det var den der var: Ej skal vi ikke gøre sådan?-Jo, skal vi ik?. Så der var hele tiden altid kun én, der fik den der fede succesoplevelse. Nu sidder man en hel klasse, hvor alle 28 får fornemmelsen af jeg kan det her. Så derfor har vi- har vi opprioriteret det individuelle, Den måde vi prioriterer

samarbejde- eller fællesskabet vil jeg hellere kalde det det er, at vi lader eleverne snakke sammen undervejs og reflektere med hinanden undervejs omkring, hvordan det er at være i den her proces. De spiller skitser for hinanden og motiverer hinanden, inspirerer hinanden til at gå forskellige veje. Torben har taget nogle valg, spiller det for de andre; Hvordan har du lavet den lyd? -eller- Hvad tempo er det? eller- Hvordan har du gjort det, får inspireret nogle andre til at gøre nogle andre ting. Så i det ligger der også en masse fællesskab. Samskabelse er ikke nødvendigvis en præmis for at der sker noget der er fællesskab-opbyggende. Hvis man kan sige sådan. Men, men i den bedste verden der vil vi klart have flere dage, så vi både kunne give dem eller lade dem komme i mål med et projekt, de selv havde lavet, og et projekt de har lavet sammen med andre.

[19:56] Interviewer1: Så hvis man skal fortsætte med det, så må man sige umiddelbart, så har i ikke rigtig fokus på det sidste spørgsmål?

[20:03] Speaker: Ja, altså. Vi laver sådan, at hvis der er nogle elever, og det er der jo altid, at der er nogen der lidt hurtigere har taget nogle valg og derfor er i mål med noget, som de synes der fungerer, og så i stedet for at lade dem arbejde videre. Vi vil gerne have, at de arbejder i nogenlunde samme tempo. Så får de nogle ekstra aktiviteter de kan sidde med. En af de ekstra aktiviteter; for eksempel hvis jeg ser både Sanne og Brian, de begge to er færdig, og jeg kan se, de har allerede har en eller anden form for interaktion imellem dem. Så sætter jeg dem sammen til at lave et beat sammen. Så giver vi nogle samskabelse teknikker, så vi putter det på som et naturligt add-on, så snart de er klar med deres eget. Så ja, prioriteten er at de altsammen mærker jeg kan det her, jeg troede ikke jeg kunne, -og- det er ikke kun Morten der går til musik der kan, Jeg kan også det her. Men i de der perioder, hvor der er fri-fri, fordi man venter på de andre, så sidder de ikke bare og venter eller laver et eller andet skod. Så kan vi netop putte noget samskabelse på der.

[21:11] Interviewer2: I forhold til selve programmet. Hvor meget er der en læringskurve i programmet? Er det sådan meget hurtigt man lærer det, eller er det sådan I skal guide dem til. Her er de her menuer og dot dot dot Eller er det noget, hvor det bare er gå ind og gør det selv?

[21:26] Speaker: Vi styrer meget læringskurven i forhold til programmerne, fordi at vi kan se, at hvis vi har flere forskellige programmer vi bruger. Men når vi starter med at præsentere et program, så er det vigtigt for os, at de ret hurtigt kommer i gang til at fokusere på lyd.

Så hvis jeg præsenterer dem for eksempel for en DJ-app, så viser jeg dem tre features i den app, for eksempel: play knap, slette knap, og hvor man kan styre effekterne. Og så er der selvfølgelig alle de andre knapper. Og somme tider er der en enkelt der spørg ind; Hvad kan der knap?, Det skal jeg nok vise dig senere, og du bliver vild med den! Jeg skal nok vise dig den senere, men vi starter her. Og ofte er det faktisk sådan, at hvis jeg peger på tre ting, de skal fokusere på, så er det de tre ting, de fokuserer på. Og de slapper af, fordi de ved, at de ikke skal fokusere på alt muligt andet. Og det betyder det nemmere at komme i gang. Så vores tilgang til det er meget struktureret. Det er meget sådan ledelses agtigt. Vi sætter en framing og bestemmer, hvad for en vej de skal gå lige nu, og hvad de skal fokusere på lige nu. Det betyder også, at hvis det er et program, der har en masse; Den menu, betyder det-Den menu, betyder det, Derinde kan man det-Derinde kan man det, Der kan du ændre på lyden-Der kan du ændre på tempoet, Her kan du se felterne. Hvis vi fortæller dem alt det (...) Så, gå i gang, nu skal du lave dit eget beat. Der er, for det første-for det første meget svært at gå i gang, fordi hvordan skal jeg implementere det i et beat? Hvordan kommer jeg i gang? For det andet, jeg kan ikke huske det hele.

[22:57] Speaker: For det tredje, jeg når aldrig at fordybe mig i nogen af funktionerne. Så vi gør meget ud af at- selvom de for eksempel har været- mange har prøvet at lege i Garageband før, så lader vi- Så fordyber vi os i bare en eller to af funktionerne, så vi er sikker på, det har lyttet sig ind på noget, inden vi giver dem lov til at gå videre til en ny funktion. Og vi kan også se, at hvis vi har gjort det på den måde og ikke bare giver dem hele paletten med det samme eller omvendt, hvis vi giver dem hele paletten med det samme. Her er der felter, her er der tempo, her er der lyde, her er der effekter, her indspiller du, her sletter du, Værsgo at gå i gang. Så kan vi se der mange der- For det første får de lavet noget, der er ret ens, for der er som regel de knapper, der motiverer mest, som de får trykket på. De får ikke lyttet så meget, så derfor det bliver meget ens det de får lavet, når de kom til at lytte til hinanden. Plus at de er ret hurtig færdig. Nu jeg færdig! Hvad skal jeg nu? Og det er jo også min opgave at være med til at de kan fordybe sig i det her i måske 40 minutter, og det kan jeg ikke, hvis jeg giver dem alle tangenterne på en gang. Værsgo her et klaver! Lav et klaverstykke til mig.-Du skal bare trykke på dem. Du bestemmer selv. Det- Sådan får man ikke lavet et fedt klaverstykke.

[24:13] Interviewer1: Jamen jeg tror faktisk det var det med de spørgsmål. Så vil jeg bare sige tusind tak for det.

[24:19] Speaker: Jamen selv tak. Jeg synes, det er fedt, at der er nogen, der interesserer sig for de her ting. Det er virkelig, virkelig dejligt, at nogen interesserer sig for os, i forhold til motivationen, der ligger hos eleverne. Musikundervisningen fungerer jo kun i min verden, hvis det er at det kan motivere eleverne til at være der. Og hvad motiverer dem? Der er mange forskellige ting, de bliver motiveret af, men det er tydeligt at se, at netop det her med selv at skabe noget, er en kæmpe motivationsfaktor.

[24:52] Interviewer1: Helt klart.

A.5 Transcript of interview with spokesperson of the Danish Musical Museum

Date: 22-03-2014

Speaker1: [00:00:01] Godt. Jamen kan du starte med at introducere dig selv kort.

Speaker2: [00:00:06] Jamen, mit navn er Ulla Hahn Ranmar. Jeg er formidlings ansvarlig her på Musikmuseet, som er en del af Nationalmuseet, hvor jeg sidder med forskellige formidlingsopgaver, blandt andet her på Musikmuseet. Min egen baggrund er jeg fra Musikvidenskab og pædagogik, har en Master i Innovation og Kreativt lærings design også, så det er min opgave her er at få skabt nogle aktiviteter, som involverer samlingen, men jo også på en eller anden måde får skabt. Vi har meget tesen om, at vi skal skabe noget, der er sanseligt tilgængeligt.

Speaker1: [00:00:37] Så det sagde du sådan lidt, men hvad er din rolle her på musikmuseet?

Speaker2: [00:00:39] Jamen, jeg er formidlings ansvarlig. Så jeg står både for at planlægge primært skoleaktiviteter mere og mere også de her publikums aktiviteter vi så tilbyder i weekender eller i ferie. Og så har jeg ansvar inden for Prinsens Palæ, så det måske. På papiret er det måske en ottendedel af mit arbejde der foregår her ude nu.

Speaker1: [00:01:03] Hvilken aldersgruppe tiltrækker Musikmuseet mest.

Speaker2: [00:01:12] Inden for undervisning? Tænker I? Eller tænker I generelt? Altså skole grupper er det jo når vi snakker som er vores primære besøgs grupper her nu, fordi vi er åben på den måde vi er. Hvis du kigger volumenmæssigt, så vil det være mellemtrinnet vi har flest

af, og når hvis du kigger på vores ferier, hvem er det vi tiltrækker, som er åbent besøgssted, så vil det være, børnefamilier altså folk som gerne vil have nogle aktive tilbud, noget der er lidt anderledes. Og så er det også folk der har en musik interesse, altså bedsteforældre med deres børnebørn og nogle der også gerne lige vil give dem et indblik i musikkens verden. Så det er nok dem vi tiltrækker mest.

Speaker1: [00:01:59] Du sagde lige mellemtrinnet. Hvad er det helt specifikt?

Speaker2: [00:02:02] Det er fire til sjette inklusiv begge,og det er der, hvor de har flest musiktimer.

Speaker1: [00:02:11] Så hvilke årsager mener du så, at den nævnte aldersgruppe her, som er nok mellemtrinnet eller børn.

Speaker2: [00:02:17] Når vi snakker dem ikke? Vi kalder dem de ikke frie børn, fordi det er dem, der kommer i skolesammenhæng. Der er i virkeligheden lærerne. Skal man så tænke på det lærerne, der vælger for dem. Det er jo, fordi vi på nogle måder bidrager den opgave, som skolen skal udføre. Så primært handler det jo om, at vi på nogle måder bidrager til nogle mål, som undervisningen har. For eksempel et instrument kendskab, indblik i musikhistorien, så på den måde kan vi give dem det på en anden måde. Vi laver også forløb, som handler mere om det kreative, de kreative forløb, som de også godt kan lide. Vi har også lavet noget, som kobler fag. Så vi prøver hele tiden tale ind i den skoleverden, der er. Man prøver at tilbyde noget, som er anderledes end det de selv kan skabe. Så det er jo det primære, tænker jeg. Og når vi snakker om det, var det jo mellemtrin du spurgte til.

Speaker1: [00:03:02] Det var mere, hvilket årsager mener du, at den nævnte aldersgruppe tiltrækker mest? Hvad synes du er grunden til.

Speaker2: [00:03:09] At hvis vi kigger på de frie, så er det jo det der med oplevelser sammen. havde en lidt anderledes. Når det familie for eksempel kommer i ferierne, så handler det om at få nogle oplevelser sammen og noget, som man ikke rigtig kan få på andre måder i byen samme måde som her. Altså musik tilgængelighed på den måde.

Speaker3: [00:03:29] Undskyld, jeg afbryder meget kort her. Så tilbage igen til de ufrie børn. Og så synes jeeg der er noget spændende her, når du siger at de børn ikke kommer selv fordi de selv vil men det er fordi læren har valgt. Og der sidder jo så på en inspiration af muligheder, det vil sige prøve at gøre det spændende og lave de kreative processer eller

andet. Det kan du bare så lidt ind i, hvad I føler mest succes med eller andet. Der var virkelig fedt, at børnene får lov til at udfolde sig mest og der tænker det er faktisk en sjov oplevelse, selv om det ikke var frivilligt.

Speaker2: [00:03:53] Mit yndlings eksempel er når jeg står ude ved døren. Jeg underviser ikke selv, det gør jeg så nogen gange. Det er mig der har skabt forløbene, og så har jeg nogle studerende der undervisere, men nogle gange står jeg selv på gulvet, når jeg så står med børn ude på døren så siger de nej, jeg troede ikke, det var så sjovt at gå på museum, så ved jeg har jeg gjort (det godt), Fordi der er jo nogle forventninger om de her musik museum. Så der er nogle forventninger hos børnene om, hvad et museum er. Men der hvor jeg oplever at energien og entusiasmen er størst, det er når de selv får lov til at skabe noget faktisk. Og der vi snakker lidt om sådan noget sådan det vi kalder tærskel fortryllelse. Det der med at vi kan også se, at der er nogle børn der blomstrer på en anden måde, når de kommer, kommer ind i en samling med en klasse, hvor de har deres lærer med. Der er nogle forventninger til det i en klasse eller et fællesskab, som vi nogle gange kan bryde ved at komme ind i det her rum, hvor vi laver nogle andre processer med dem. Så der er nogle, der sker nogle mellemmenneskelige ting i forhold til at være her, trivselsmæssige ting kan man sige.

Speaker1: [00:04:48] For der er et spørgsmål, der hedder hvorfor har jeg valgt børn som målgruppe? Men det er jo lidt mere undervisnings tilgangen.

Speaker2: [00:04:55] Det er fordi vi underviser. Man har de her skoletjenester rundt omkring på museer, og det er også en central del af det, som vi som museer skal. Vi skal jo gøres tilgængelig for alle, men der er også en undervisnings på den måde skal bidrage ind i den del af samfundet. Så det er også en forpligtigelse alle museer har.

Speaker1: [00:05:12] Men hvis vi snakker omkring de frie, har I prøvet at forme jeres museum efter en specifik målgruppe eller prøver I at fange så en stor og bred målgruppe som muligt?

Speaker2: [00:05:23] Virkeligheden er vi jo skiftet. Jeg kom til at lige på museet og skulle til at åbne og skulle drive den her skoletjeneste, der var her, men at museet i sin oprindelige form blev meget bygget på, at der skulle være et pædagogisk tilbud. Og så havde vi en udstilling, som i høj grad var mere rettet mod dem, der lignede dem, der drev museet. Dem som havde musik baggrund, der forstod den violin bag glasset det var, det var selvfølgelig en meget, meget fin violin. Og så er der dem, der kunne afkode museet, fordi de havde en

erfaring inden for musik og så sige, at målgruppen har ændret sig, Hvor vi prøver at gøre det mere tilgængeligt for dem, som ikke har en musik baggrund.

Speaker1: [00:05:58] Så er der større målgruppe.

Speaker2: [00:05:59] Måske fordi den anden målgruppe ikke så stor i virkeligheden. Den brede målgruppe ligger jo faktisk i dem, som ikke er de indviede, så vi har forsøgt. Vi har selvfølgelig stadigvæk en samling med nogle meget unikke instrumenter, som jo også er tilgængeligt for dem, som er de meget musik, entusiastiske. Men vi har også forsøgt at gøre den tilgængelig for andre. Så som du siger ja, vi forsøger at brede målgruppen lidt mere ud.

Speaker1: [00:06:22] Så er der et spørgsmål der hedder har i noget data på den er målgruppe valgt, men den tænker vi kan tage efter interviewet. Det med at hvis i har noget data, der kunne blive sendt til os i forhold til hvis der er noget, vi gerne må få, om vi.

Speaker2: [00:06:37] Må få adgang til det. Vi har lavet nogle. Vi har lavet nogle test på de der to instalitioner, jeg viste jer, og vi har lavet på vr headsettet og appaen. Den der har den har vi lige testet på. Jeg har lavet nogen analyser af det. Jeg ved faktisk ikke om jeg må give jer adgang til det. Det må jeg vel godt, for det er os der har lavet det. Den her har vi haft nogle studenter, der har lavet ting, og så har jeg også nogle. Jeg har nogle interviews. Som en af mine studerende lavede med nogle af de studerende, så vi fik ikke vist, at vi har et stort klassesæt i VR. Så når de har været nede og prøve det klingende museum hernede, altså prøve at spille på instrumenter, så er de også oppe og prøve en vr oplevelse. Orkestret som åbner en virtuel altså hvad hedder en virtuel koncertsal udefra? Så det er der mødet mellem. Det er meget taktile og så det virtuelle har vi også nogle interview på, så jeg ved ikke hvad er det for nogle interesser, I har?

Speaker1: [00:07:32] Jeg tænker igen måske kan vi bare tage det efter interviewet, fordi at det er data. Det er bare noget praktisk er sendt, men så hopper jeg bare videre med det samme. Så var der jo lidt, den har der allerede svaret på. Hvilken gruppe prøver prøver I at trække flere af, tiltrækker en lidt bredere målgruppe med folk

Speaker2: [00:07:54] Det er jo både i forhold til at få et øget besøgstal, som jo så ikke alt det, men jo også at udfylde en opgave i samfundet, som ikke handler om at tiltrække dem der ligner en selv, men faktisk også gør det tilgængeligt for folk. Så er det også sådan et

samfundsblik.

Speaker1: [00:08:11] Så er der et spørgsmål, der Har Musikmuseet taget nogle initiativer i forbindelse med undervisning. Hvilke initiativer er det?

Speaker2: [00:08:17] At opbygge skoletjeneste i sig selv? Og så prøve at kvalificere? Jeg kommer fra sådan et vidensnetværk, som jo hedder Skoletjenestens Videnscenter for eksterne læringsmiljøer, hvor vi er et netværk på tværs af museer, så at der er sket en masse udviklingsarbejde på det her, så jeg laver det, der hedder pædagogisk apparatur og på at udvikle metoder, har jeg gjort her. Det er det, jeg laver andre steder. Så vi har lavet en masse pædagogiske udforskninger af forskellige metoder for at prøve at aktivere det på forskellige måder. Jo.

Speaker1: [00:08:46] Så arbejder vi videre til et andet punkt, der hedder viden. Så nu er det helt generelt med mere og mere praktisk. Hvad er jeres indgangsvinkler til, at når I skal lave et projekt, hvad er det så, I starter med at gøre?

Speaker2: [00:08:59] Altså hvis vi snakker om de ikke frie børn, er det den del vi snakker om?

Speaker1: [00:09:04] Hvis i laver en installation.

Speaker2: [00:09:06] En installation. Altså de samarbejder vi har haft med Aalborg for eksempel. Har vi haft sådan lidt partnerskab kørende, hvor det handler om at finde ud af, hvad kan I? Og hvad kan vi så finde et felt, hvor vi faktisk bidrager med noget sammen. Så for eksempel hvis du ser på Appaen deroppe den der installation, så handler det om, at vi har nogle udfordringer formidlingsmæssigt. Men vi har også noget viden om de instrumenter og den måde det klinger på. Den historie, der ligger bag instrumenterne. Og så har vi jo kombineret det med jeres viden omkring, hvordan kan vi tilgængeliggøre det igennem teknologi og så videre. Så det er jo blevet til på grund af de der samarbejder, der kan opstå. Nogle af de andre institutioner, for eksempel fleks spacet handler mere om, at i samling har vi ikke noget, der taler til efter 19 ud af 20, for eksempel. Så hvordan kan vi så få noget ind i udstillingerne og noget aktivt, som taler ind i en fremtid? Så det har mere været et hul i udstillingen. Så har vi selvfølgelig hele tiden den der. Vi snakker meget om musikkens magi, altså det der med hvordan får vi skabt det der særlige omkring instrumenterne? Det handler jo om at få lov til at røre og gøre.

Speaker1: [00:10:13] Men jeg har ikke en skabelon, kan man sige. For hvad når I laver et nyt projekt, at I den i følger?

Speaker2: [00:10:20] Nej, ikke sådan. Nej. Det opstår jo meget ud fra forskellige. Altså Omnien den store runde. Den var udbygget . Når vi så har lavet det med Aalborg og været at finde ud af hvad kan vi sammen og så finde ud af. Og så er det jo en kreativ proces i forhold til at sige Det er ikke sådan, at jeg kommer til, at jeg skal have det instrument, der skal se sådan ud på den. Men vi bygger sammen og prøve at finde ud af hvordan. Hvordan skaber vi noget, som får tingene til at mødes og de behov vi har?

Speaker3: [00:10:48] Nu ved jeg ikke. Er der fast, er der altid en fast, så som udstilling, der er der lavet sådan specielle udstillinger. Det er mere ressourcemangel. Men når vi nu taler om, hvordan er det så at vi mangler noget fra 19/20 eller opad efter det? Så det kan man kalde det. (Utydelig)

Speaker2: [00:11:30] Ikke frie.

Speaker3: [00:11:31] Ufrie børn. Og du ved børnefamilier gerne være lidt innovative, og der er åbent et døgn. Så tænker man dem ind, når man går ind i projektet. Men det gør.

Speaker2: [00:11:42] Vi jo ud fra de erfaringer, vi har. Vi kan jo se, hvad der fungerer, så det er jo derfor, vi går i retning af at skabe nogle taktile oplevelser. Nogle hvor man kan udforske kreativt, nogle forskellige ting, så man kan sige. I virkeligheden, så styrker man det jo ved at sætte en som mig, som har en basis erfaring for undervisning. Så jeg har en masse erfaringer i forhold til hvad der fungerer og så og så kopiere. Når vi kører efter eller vinterferie aktiviteterne her, så handler det jo for mig om at se de små greb fra undervisningen, og så lægger vi det ud som aktiviteter til til de almindelige publikummer, og det virker på dem. Så det er meget at finde nogle greber, som vi på den måde kan flytte rundt mellem de forskellige målgrupper. Og oplevelsen er faktisk, at vi kan smide dem ind i de der instrument rum. Om det er mellemtrin elever eller det er voksne grupper. Det er ikke det store problem det er, at der er meget der går på tværs af målgrupper, når vi ikke er et. Vi er jo ikke sådan et videns lag. Vi jo mere sådan eksperimenterende forsknings lag, og det gør jo, at vi kan gøre flere ting på tværs. Svarer på jeres spørgsmål?

Speaker3: [00:12:43] Det gav en god vinkel til der hvor jeg sad med det spørgsmål hvordan man til hvordan I vælger at tilgå projekter og lande som jeg ser også synlig viden om denne

dag. Det er altid spændende at kigge på hvordan andre vælger at gå til, når der skal laves noget nyt eller andet. Jeg tror det kalder på tidligere erfaringer, plus hvad synes jeg det svarede fint på spørgsmålet.

Speaker2: [00:13:02] Men der er jo. Det kommer meget an på hvad er det for nogle fonde vi søger? Så for eksempel det vi lavede, når vi har lavet Appaen, og det er nogle midler, Jeg har søgt fra Augustinus Fonden, så laver jeg en projektplan, og der handler det om at lære noget omkring de her. Hvordan får vi samlet viden til, så vi kan lave et større projekt på det Så projekterne og fondene, vi søger, er i sig selv med til at forme de projekter, vi laver. Når man så, hvis man skal eksterne midler, så er det jo fonden også, der er meget afgørende for hvad kan vi med de midler.

Speaker1: [00:13:41] Så hvad synes du? Er den lang tidige udvikling I håber jeg at se i børnene/gæster fra jeres initiativer eller jeres installationer.

Speaker2: [00:13:55] Så ja, så hvad er det for nogle læringspotentiale? Ja, det er sådan lidt pædagogisk. Jamen, min grundtese er, at alle skal opleve sig selv som kreative skabende væsner, og det kan jo være kreativitet på et lille plan. Sæt to toner sammen, og så har du gjort et eller andet. Og det der med at prøve at gøre instrumenterne mindre farlige. Hvis vi sætter en voksen foran en cello, så har man allerede den der ude. Men det skal man kunne et eller andet særligt på for at spille. Så det der med at prøve at gøre dem mere tilgængelige på en måde, hvor det bliver også lidt ufarligt, at folk tør bevæge sig ind i det. Det er nok det aftryk, jeg gerne vil have at vi har på folk. Selvfølgelig også gerne fornemmelse af, at man også havde musik i oldtiden og i dag, og det er godt på tværs af kulturer og sådan nogle ting. Men det er mere den personlige oplevelse med musik.

Speaker1: [00:14:50] Hvordan måler I jeres succes og jeres programmer slags udstillinger? Har en eller en bestemt måde I har, laver nogle interviews med folk eller snakker med dem?

Speaker2: [00:15:02] Vi gør det ikke så meget i forhold til udstillingen. Vi gør det i forhold til projekterne, fordi der skal man afrapportere, og så gør vi os i forhold til undervisningen, selvfølgelig.

Speaker1: [00:15:10] Men jeg tænker, at vi skal fokusere på det, vi fokuserer nemlig kun på udstilling og installationerne.

Speaker2: [00:15:17] Altså man kan sige vi har fokuseret på at teste installationer, når vi gør det i et projekt. For eksempel så er det Augustinus der tog installationen er der med VR, altså glas harmonikaen der stod udenfor. Og så det her med den der Appa. Dem tester vi, fordi det skal vi gøre. Det har vi planlagt at gøre ind i et projekt, så der tester vi. Men ellers så tester vi ikke så specifikt på den måde i forhold til installationerne. Men når det ligger i projekter, så gør vi.

Speaker1: [00:15:44] Sagde, at du ville I skulle teste på dem. Hvordan er det, I kommer til at gøre det?

Speaker2: [00:15:48] Vi er i gang, De to første har vi lavet interview med. Når vi har stået der med dem, så har vi lavet en masse interview og observationer på folk, og det her så analyseret på og lavet en rapport på, som bidrager ind i et projekt. Så laver vi nu en installation mere i det projekt. Der får vi en ekstern til at evaluere outputtet på det. Jeg havde en studerende til at interviewe elever i forbindelse med det der med VR og vores klingende museum, hvor de skal. Der er nogle forskellige, men det er tit ind i projekterne på en anden måde, når vi skal lære noget i projekterne, fordi vi så tester I for at teste læringsforløbene, så handler det mere om, hvad er det samlede output. Det er ikke lige præcis, hvad gør den installation ind i det, så vil det mere være det overordnede ikke.

Speaker1: [00:16:33] Jo, du sagde lige at jeg sagde lige, at du sagde noget med, at du vil observere nogle mennesker, der prøver installationerne. Hvad mener du med det?

Speaker2: [00:16:42] Vi gjorde altså med APAAEN og Glasharmonikaen. Der gjorde vi det, at vi observeret dem først og så spurgte om vi måtte interviewe dem bagefter. Så havde vi en del af daten på samme gruppe som handlede om at sige: Hvad gør de egentlig? Altså for eksempel oppe i glas harmonikaen? At de tager faktisk enormt mange billeder af hinanden, når de står der. Altså sådan nogen, de der sådan lidt, hvad sker der egentlig omkring hvor meget, hvor sociale er de omkring sådan nogle ting og så ellers interviewe omkring deres egen oplevelse? Det er primært det vi har gjort. Så har jeg observeret børn i forskellige undervisningssammenhænge, og det er jo sådan det kommer meget an på, hvad det er for nogle mål, jeg har med det.

Speaker1: [00:17:27] Jo, Kan du dele nogle succeshistorie eller markante oplevelser med tidligere, hvor du hvor du tydeligvis... tydeligt har set en positiv indvirkning på jeres program, på børns slash, gæsternes musikalske udvikling og glæde?

Speaker2: [00:17:40] Er det specifikt... Er det hele museet eller det specifikke installationer?

Speaker1: [00:17:43] Det er nok, når det har været institutioner kun, så det ikke noget med undervisningen at gøre.

Speaker2: [00:17:50] Jeg synes jo det, at når jeg kommer ind i det der rum, den den renelaiter, der stod som der var mørkt nu ikke. Men når jeg kommer ind i et rum, og jeg ser, at der står måske tre unge over og spiller på det instrument, så sidder der en gruppe, observerer dem også og følger med, og det er et eller andet med det der lys, der gør det. Så det skaber et eller andet fællesskab omkring det. Det synes jeg er det gør noget på en eller anden måde ikke, når man ser unge mennesker stå omkring mashmachinenen der oppe, den firkantede der. Og man kan se, at de er fuldstændigt fordybet ind i det. Vi kan jo høre dem, fordi de har høretelefoner på. Men du kan se musikken, fordi hele kroppen kører. Så den der interaktion, der er i gang med dem. Jeg kan jo ikke få dem væk fra den. Det er jo mig, der skal sige stop. Jeg har lyst til at blive ved Omni en den store runde der. Og det gør jo også noget i forhold til at få folk til at folde sig ud. Ja, der er også ældre mennesker, der går op til den, og så står de og trykker på den. Den er meget. Der er meget lav indstigning på den. folk ved faktisk at jeg skal trykke på en knap, selv om der er jo ikke deciderede knapper, men folk kan hurtigt finde ud af, hvad de skal, uden at der er så mange. Det der med du skal kunne mestre en cello, for at kunne gøre det ikke. Så den den har den. Det er meget tilgængelig og det er alle aldersgrupper. Når børn laver sådan en cirkel rundt, laver kongens efterfølger rundt om den. Så jeg er glad. Når folk griner. Det er en succesoplevelse.

Speaker1: [00:19:20] Så er der et spørgsmål, det her. Det har du allerede svaret på lidt før. Men måske er det godt lige at få det helt ned. Hvorfor synes du, at det er vigtigt at give børn mulighed for musik læring gennem ud i jeres installation og slags udstillinger?

Speaker2: [00:19:33] Jeg synes, det er vigtigt, fordi vi giver dem noget andet. Hvis du går ud på en skole, så har du også et musiklokale her. Der har vi en tilgængelighed og instrumenter, som er meget bredere, så vi er et meget mere udvidet instrument rum for dem. Og så kan vi jo lave den der kobling med i tid, som jo er meget fysisk. Man kan godt spille et gammelt stykke musik for en skoleklasse og give dem en fornemmelse af hvordan lød det. Men her kan vi jo så gøre det i sammenhæng med nogle historiske genstande. Og der er jo det, vi kan, og vi har det der tidspunkt også. Det er det, jeg synes, vi kan. Det var det svar. Hvad var nu

spørgsmålet var?

Speaker1: [00:20:14] Spørgsmålet var Hvordan synes I, det er vigtigt at give børn mulighed for musik læring gennem gennem udstillinger?

Speaker2: [00:20:20] Grunden til at de siger det er også fordi diskussionen og det kan blive alle mulige andre fag også tilsyneladende. Men det her med at sige hvad skal vi ind og udfylde en rolle i skolen? Vi kan se argumentet for at åbne det her var faktisk også det, der står i musikundervisningen på skolerne, at vi skal ud og hjælpe dem, og det synes jeg faktisk ikke er vores opgave. Vi skal heller ikke skabe den der musikalske fødekæde, der handler om, at jeg har der børn, der kommer her, og hvis de så får en saxofon, så begynder de at spille saxofon bagefter. Det er da også en succes, men det er ikke den primære. Det er ikke sådan, at vi skal skabe musik, og vi skal ikke skabe oplevelser med musik for alle, og vi skal ikke ind og ud og skabe musikundervisning, fordi den ikke er i skolen. Vi skal være et bidrag ud over det, vi skal. Vi skal ikke løfte en opgave ind i skolen på den måde. Vi har det alternative læringsrum, som også eksisterer ved siden af skolens læringsrum. Ja, det gør det.

Speaker1: [00:21:15] Den er der blevet svaret på. Ikke den der. Fordi den er undtaget herfra.

Speaker3: [00:21:20] Det er en mulighed.

Speaker1: [00:21:24] Ja, der er der. Den er måske lidt. Den er nok blevet svaret på, men det er måske lidt vigtigt at få den dækket alligevel. Når jeg skal bygge en ny installation, så hvilke parametre kigger jeg på for at den noget skal det værd, at den skal den være for eksempel. Højden skal være let tilgængeligt. Skal der være en god form for akustik i den? Er der nogle bestemte faktorer og parametre i?

Speaker2: [00:21:49] Grundlæggende fordi hver installation vil have sine parametre. Jeg vil også have et. Ud over at den fordi en af de første der. Den skal være driftsikker, fordi det er sådan et problem, ikke noget der kan mærkes, når man kommer op og tingene ikke virker. Men det andet er jo også jeg vil jo have en, for eksemplet mashmachinen. Den skulle tale et eller andet fremtids instrument, så det vil jo også være en parameter, der taler ind i det mål indholdsmæssige mål vi har med dem. Men selve installationen vil jo også. Så den skal være. Der skal være lav indstigning, det skal ikke kunne. Det skal være nemt at gå til, så du ligesom forstår. Hvad er første jeg skal gøre. Men der skal også være. Den skal være driftsikker, fordi

det er sådan en udfordring for museer, at man har netop teknologi. Og der er ikke noget så slemt som teknologi, der ikke virker. Og vi har jeg har av folk på det store museum, når jeg skal dem herover og hjælpe med noget, så det tager tid, så man kan ikke. Det skal gerne være så driftsikkert, at folk tester på ting hver gang du laver interaktioner. Nu har vi jo lige lavet et musikrum inde i Prinsens Palæ og det udstillinger der guitarerne, de får tæsk, lyd, panelet får tæsk og nogle ting, så der er nogle. Fordi grundtesen for mig er, at når folk får noget som kvalitet, så behandler de det også respektfuldt. Det gør de allerfleste, og så er der nogle, som bare ikke kan styre sig, hvor det bare går sådan op. Især hvis de sendte fem drenge i alderen 13 år ind i et rum, hvor de får en masse instrumenter. Det er godt i starten. Måske tænker vi skal bande, men intensiteten gør, at de nogle gange får. Så det er ting, der for tæsk. Det skal virkelig være driftsikkert.

Speaker1: [00:23:27] Du sagde lige åh undskyld.

Speaker2: [00:23:29] Jeg sad og tænkte om jeg fik svaret på det hele, og om der var flere ting, men vi tager den bare.

Speaker1: [00:23:32] Du sagde lige med lav indstilling

Speaker2: [00:23:34] indstigning ja

Speaker1:[00:23:35] lav indstigning. Hvorfor er det vigtigt.

Speaker2: [00:23:38] Jamen for at ikke få koblet nogle af, for at alle har en tilgang til det? Jeg kan jo sætte mashmachinen op, kan jeg sætte folk i gang med. Noget de ikke opdager det. Der ligger nogle filtre i pladen, du kan bevæge klodserne hen over, sådan at du kan have noget, du kan. Højfrekvent lavfrekvent. Der er ekko og rum i den. Det opdager folk ikke nødvendigvis. Det skal de lytter til, men de forstår, at der er et eller andet. Jeg skal ligge det der. Den er ret nem. Vi har ikke nogen forklaring. Folk gør det, der ligger ikke sådan: "Du skal gøre det her.". Folk får faktisk gjort det med det samme, for der er hurtig en feedback. Du gør noget, så sker der noget om det fungerer. De lidt mere subtile elementer kan godt nogle gange være svært at opdage, og så er det vigtigt job dem eller det bare fedt, hvis der er sådan en ekstra lag, du lige pludselig opdager. Det jeg ikke vidste jeg ikke lagde mærke til inde i rummet, lige ved siden eller lige mellem mashmachinen og det der klangrummet vi var inde i. Der stod sådan et bord med nogle højttalere og nogle paneler på, og det er sådan en installation som er lavet. En komponist som er super fin, men den der ligger nogle.

Det der med at der ligger så subtile ting i den. Hvis der er noget spil logik i folk fanger den faktisk ikke. Det er måske lidt et eksempel på, at den er for subtil og overtænkt. Det der med hurtig feedback på du gør noget, okay jeg har gjort noget rigtigt. Måske hvis man kan skabe nogle opdagelses lag, men der er den der. Der er et behov for, at du hurtigt forstår at få nogle succesoplevelser grundlæggende og noget du kan arbejde videre med.

Speaker1: [00:25:08] Det var godt, fordi der blev lige uddybet med hvad du mente før. Hvordan sikrer I, at udstillingerne bliver? Installationerne forbliver et værktøj for kreativitet snarere end barrierer for børnene?

Speaker2: [00:25:21] Men det ligger faktisk lige præcis i det. Jeg synes ikke, jeg oplever, at folk ikke synes, de kan være kreativ med strukturen. Hvis du sammenligner omni og mashmachinen. Omni'en, bliver de hurtigere frustreret, fordi man mangler nogen og man mangler noget stilladsering omkring. Mashmaschinen giver dig allerede rytme, en rytme. Den giver dig nogle strukturer, du så kan bygge på ligesom legoklodsen ikke. Omni Den har en meget mere dyb det lyde, og jeg beder dem om at komponere et stykke ud fra nogle forskellige elementer. Der skal de selv skabe strukturen på en måde, så jo mere du selv skal skabe, jo mere frustreret kan du blive. Men måske skaber man også et lidt friere og kreativt rum, så det er hele tiden en balancegang mellem. Altså hvor kreativt kan vi blive? Oplever jeg mig selv som kreativ? Vil andre opleve det? Jeg tror, jeg vil møde flere, som vil synes, at en masse som syntes mashmachinen bare reproducerer noget. For mig er det et instrument, du kan kombinere på 1700 forskellige måder, og det er dig, der vælger. Men nogle vil nok mene, at omnien for eksempel er mere kreativ, fordi det er et friere rum, du er i. Men det er der jo nogle forskellige opfattelser af, hvad det kreative i virkeligheden er.

Speaker1: [00:26:36] Synes du, vi skal svare på den der? Undskyld.

Speaker2: [00:26:41] Det er så fint.Jeg føler ikke, de snakker om mig.

Speaker3: [00:26:44] Jeg tror spørgsmålet er om i stødt på nogen tekniske barrierer. Jeg synes, du har allerede været inde på der. Både der med mashen gør med komponist eller andet. Man kunne sige, at der mangler lidt feedback eller andet. Kan du gå mere ind i Hvad hedder det? Hvordan du ved, at der manglede feedback i dem. Nu oplever vi som sagt ikke deroppe.

Speaker2: [00:27:03] Der mangler ikke feedback i den, den har feedback. Du ligger en klods

på, og så kan du høre, der sker noget.

Speaker3: [00:27:07] Men er det ikke mashen, men den anden det du taler om? Komponisten har lavet.

Speaker2: [00:27:13] Det sådan et bord, hvor der står tre paneler, og så kan du arbejde, hvor du i virkeligheden skal nogle treklange, altså tre toner, der klinger sammen og rammer de rigtige. Så vil den lave den ene, og så får du sådan en gratifikation. Det er det der spil logik i det, men det ligger så subtilt, at du kan godt. Du vil nok kunne. Du trykker på hatten og der kommer en lyd. Jeg kan trykke på den jeg så bliver den højere. Højere pitch lower pitch når jeg gør det. Men hvad sker der for de andre? Hvorfor skal jeg høre de andre, og hvornår der lige pludselig kommer sådan en? Alle de her lag, De er så subtile og det svært at forstå. Der er nogle elementer i den, der ikke folder sig ud, synes jeg, fordi det er for svært at forstå for folk og sådan nogle enkelte, som er de indviede igen ikke. Så det må gerne være. Det er det der med feedback. Du forstår Min handling, gør det her. Og så forstår du også, at der er yderligere muligheder. Altså, det synes jeg. Det er en fordel ved et instrument, at du finder ud af det, og at I kan gøre det der og kan gøre det. Det kombinationsmuligheder, men også sådan lidt easter eggs, der ligger rundt omkring, som du opdager. Var det svar på hvad var du spurgte om?

Speaker3: [00:28:15] Og det var egentlig du gik ind på. Hvad tekniske udfordringer der var jeg hvor jeg synes det var spændene at høre. Hvordan der manglede feedback på den var spændende at gå ind på og se hvornår ting kan blive for meget eller for lidt eller andet der hvor det så var problemer.

Speaker2: [00:28:27] Der noget i forhold til lyd, især når man når en vis alder. Det der med vi overvejer jo tit Skal man give dem høretelefoner, eller skal vi spille ud i rum? Jo mere person, jo mere. Hvis det var en cello for eksempel, så ville folk meget nemmere gå til den, hvis de skulle tage høretelefoner på og høre sig selv. Hvis du skal sætte dig ud med et kendt instrument, hvor der en masse andre mennesker, de skal finde ud af, hvad du slet ikke kan. Du udstiller jo dig selv med nogle instrumenter, og der tror jeg, at jo mere du. Folk vil. Mange voksne vil synge i nærheden, og andre vil det. Jo mere personligt det du skaber er, jo mere har du også brug for et personligt rum til at udforske det i. Så derfor giver vi høretelefoner i nogen sammenhæng. Også fordi lyd kan være svært at få på tværs, men også fordi der et personligt rum i det. Giver det mening?

Speaker3: [00:29:12] Det giver bestemt mening. Jeg synes det er spændende, tankegang. Jeg tænker en anden ting. Du siger hvis I måler succesen tidligt. Endda med børn, hvis så mange der var deltaget i det, ikke hvad der virker for et fællesskab eller sådan noget, bare i dit eget råd til os blandt andet. Har I nogen måde, hvordan I får målt dataen, eller er det mere bare en øjenberetning at i siger børn griner og har det sjovt?

Speaker2: [00:29:40] I de der sammenhæng, hvor vi tester det, der laver vi jo om det så er observationer eller interviews, så gør vi. Men meget af vores praksiserfaring. Jeg sidder og planlægger et undervisningsforløb, så gør det jo, på baggrund af det har nogle selvfølgelig nogle læringsforståelse Jeg har nogle erfaringer, Jeg har nogle mål jeg gerne vil opnå, og det kombinerer jeg op til at når derhen, så det er jo oftest en kombination af rigtig mange ting, hvor man skaber noget nyt selv.

Speaker1: [00:30:09] Jeg skriver bare lige ned.

Speaker3: [00:30:14] Jeg tror ikke, Jeg har ikke flere i hvert fald. Jeg synes, vi er kommet godt igennem, hvad jeg gerne ville have spurgt om.

Speaker2: [00:30:22] Så det her, hvad skal det fungere som er det behovsafklaring for jer. Skal vi bare slukke den?

A.6 Pictures of the different symbols for the block

(a) The Symbol is taken from https://www.svgrepo.com/svg/255331/drum-music-and-multimedia and made by SVG Repo

(b) The Symbol is taken from https://www.svgrepo.com/svg/521766/music-note and made by Konstantin Filatov

(c) The Symbol is taken from https://www.svgrepo.com/svg/240754/piano and made by SVG Repo

(d) The Symbol is taken from https://www.svgrepo.com/svg/480273/trumpet-3 and made by Icooon Mono

A.7 Full results from precision test one (1. iteration)

to see full datasheet: https://docs.google.com/spreadsheets/d/1U2Qo7siE-uBChRpH3ECsjO7wIb6VjF

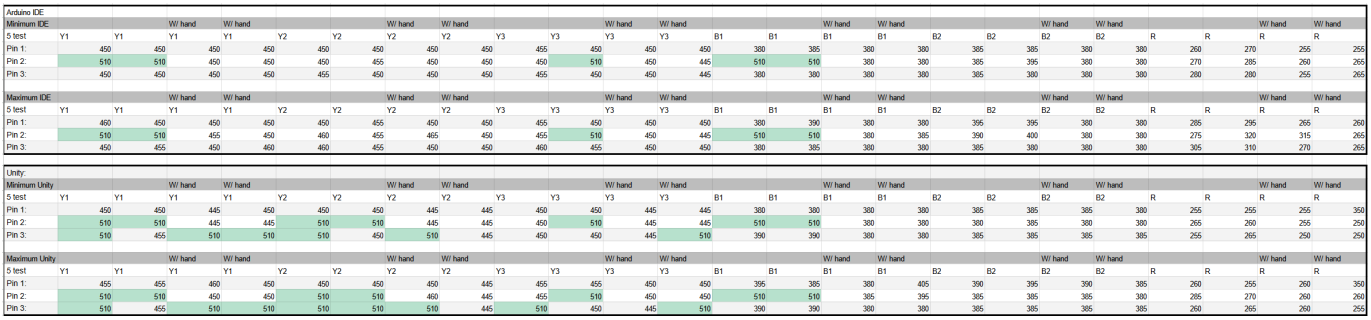
edit?usp=sharing

Minimum IDE			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand
5 test	Y1	Y1	Y1	Y1	Y2	Y2	Y2	Y2	R	R	R	R	B	B	B	B
Pin 1:	510	270	200	200	235	255	200	200	190	510	180	180	275	305	270	270
Pin 2:	510	215	205	205	210	205	200	200	190	190	180	180	285	285	280	270
Pin 3:	245	240	220	215	210	220	210	200	195	190	190	190	300	190	275	270
Maximum IDE			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand
5 test	Y1	Y1	Y1	Y1	Y2	Y2	Y2	Y2	R	R	R	R	B	B	B	B
Pin 1:	510	300	210	200	245	260	200	200	195	510	180	180	280	310	275	270
Pin 2:	510	215	205	205	215	205	200	200	195	230	185	180	285	285	315	275
Pin 3:	255	250	225	240	210	220	215	205	205	195	205	210	300	305	280	275
Unity:																
Minimum unity			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand
5 test	Y1	Y1	Y1	Y1	Y2	Y2	Y2	Y2	R	R	R	R	B	B	B	B
Pin 1:	240	225	200	200	205	205	200	200	180	180	180	180	280	275	270	275
Pin 2:	260	215	205	210	210	210	200	200	190	190	180	180	285	275	300	275
Pin 3:	250	250	225	225	220	220	210	220	215	220	225	215	300	290	285	285
Maximum unity			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand
5 test	Y1	Y1	Y1	Y1	Y2	Y2	Y2	Y2	R	R	R	R	B	B	B	B
Pin 1:	250	245	200	200	225	205	205	200	185	185	180	180	295	280	295	275
Pin 2:	510	230	215	215	215	215	205	205	200	190	180	180	285	275	305	275
Pin 3:	270	265	245	235	230	235	220	225	220	225	230	225	315	305	300	290

Figure 67: Data from the precision test 1 (1. iteration):

A.8 Full results from precision test two (2. iteration)

to see full datasheet: https://docs.google.com/spreadsheets/d/1U2Qo7siE-uBChRpH3ECsjO7wIb6VjF
edit?usp=sharing



Arduino IDE																														
Minimum IDE			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand														
5 test	Y1	Y1	Y1	Y1	Y2	Y2	Y2	Y2	Y3	Y3	Y3	Y3	B1	B1	B1	B1	B2	B2	B2	B2	R	R	R	R						
Pin 1:	450	450	450	450	450	450	450	450	455	450	450	450	380	385	380	380	385	385	380	380	260	270	255	255						
Pin 2:	510	510	450	450	450	455	450	450	450	510	450	445	510	510	380	380	385	395	380	380	270	285	260	265						
Pin 3:	450	450	450	450	455	450	450	450	455	450	450	445	380	380	380	380	385	380	380	380	280	280	255	265						
Maximum IDE			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand						
5 test	Y1	Y1	Y1	Y1	Y2	Y2	Y2	Y2	Y3	Y3	Y3	Y3	B1	B1	B1	B1	B2	B2	B2	B2	R	R	R	R						
Pin 1:	460	450	450	450	450	455	450	450	455	450	450	450	380	390	380	380	395	395	380	380	285	295	265	260						
Pin 2:	510	510	455	450	460	455	465	450	455	510	450	445	510	510	380	385	390	400	380	380	275	320	315	265						
Pin 3:	450	455	450	460	460	455	450	450	460	455	450	450	380	385	380	380	385	380	380	380	305	310	270	265						
Unity:																														
Minimum Unity			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand						
5 test	Y1	Y1	Y1	Y1	Y2	Y2	Y2	Y2	Y3	Y3	Y3	Y3	B1	B1	B1	B1	B2	B2	B2	B2	R	R	R	R						
Pin 1:	450	450	445	450	450	450	445	445	450	450	445	445	380	380	380	380	385	385	380	380	255	255	255	350						
Pin 2:	510	510	445	445	510	510	445	445	450	510	445	445	510	510	380	380	385	385	380	380	255	260	255	250						
Pin 3:	510	455	510	510	510	450	510	445	450	450	445	510	390	390	380	380	385	385	385	385	255	265	250	250						
Maximum Unity			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand			W/ hand	W/ hand						
5 test	Y1	Y1	Y1	Y1	Y2	Y2	Y2	Y2	Y3	Y3	Y3	Y3	B1	B1	B1	B1	B2	B2	B2	B2	R	R	R	R						
Pin 1:	455	455	460	450	450	450	450	445	455	455	450	450	395	385	380	405	390	395	390	385	260	255	260	350						
Pin 2:	510	510	450	450	510	510	460	445	455	510	450	450	510	510	385	395	385	385	385	380	285	270	260	260						
Pin 3:	510	455	510	510	510	510	510	445	510	450	445	510	390	390	380	380	385	385	385	385	260	265	260	255						

Figure 68: Data from the precision test 2 (2. iteration):

A.9 The full User manual

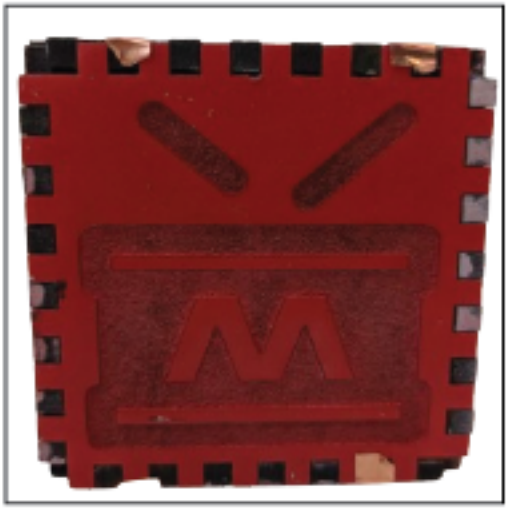
Under here the full user manual can be seen

BlockBand

BlockBand is a fun instrument
to create your own beats by connecting blocks.

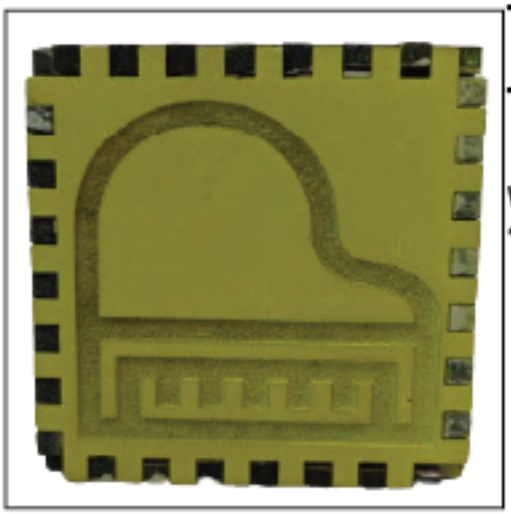
ft. KVN

Drum block



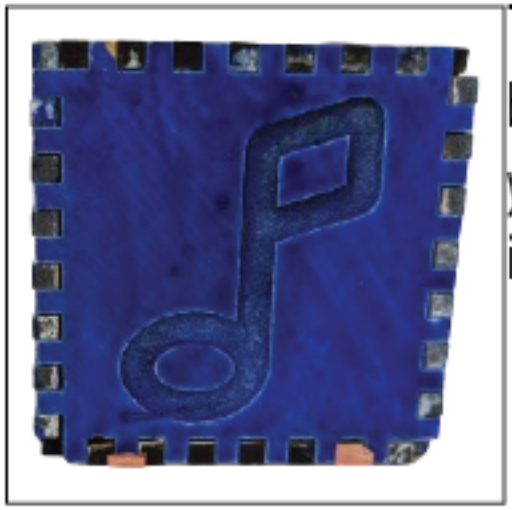
This is a drum block, which is used to produce drum sounds.
It creates a cube for the drum sound when it is placed on the motherblock,
and you may adjust the sounds and volume of the drum, inside the program.

Instrument block

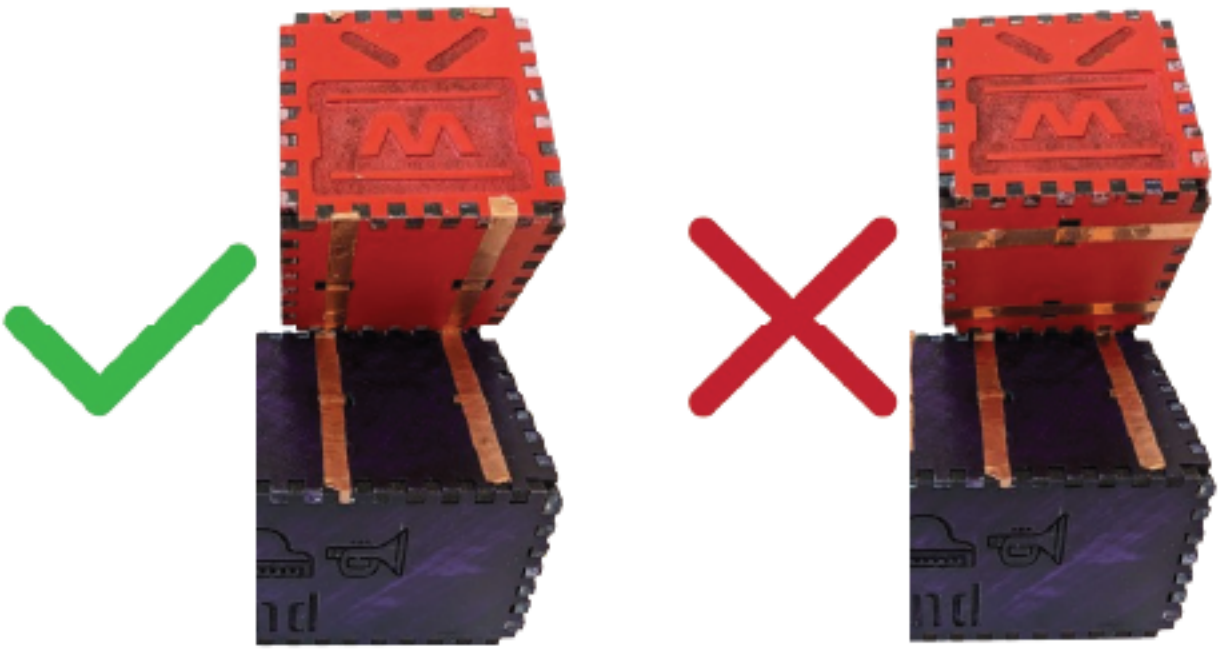


This is an instrument block, and it is filled with many instruments.
Trumpet, guitar, and piano. Similar to the drum block,
you can changeinstrument by clicking on the icon.

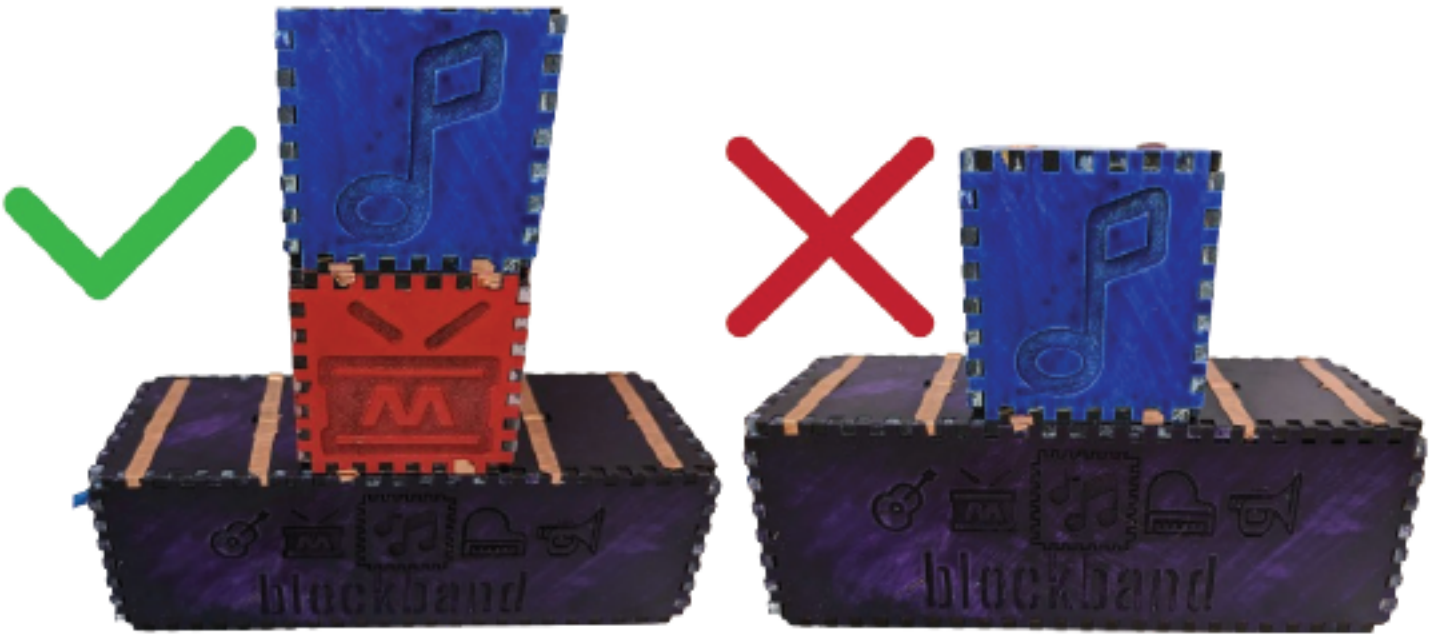
Effect block



This is an effect block, it may only be put on top of a different block,
by adding an effect block on top of another block,
you add the opportunity to add effects to your sounds produced from the block
it is placed upon.



Connect the blocks so the lanes match those on the motherblock.



Placing an effect block directly on the motherblock won't do anything!

The MotherBlock

Here you place the blocks upon

To see if the block has been registered it should go from a red X to an green check-mark.
if not, try putting it on again or press it down to make it recognize the block.

Ready to make some music? Let's get started!

A.10 Task for the first Usability test

1. Find out what the three differently colored blocks do.
2. Set the instrument and drum block on the main block.
3. Get an effect on one of the blocks
4. Press the play and pause buttons and adjust the volume and speed.
5. Change the instrument.
6. Go to the drum page and choose a new sound.
7. Change reverb of the block with effect

A.11 Graphs for Demographic testing

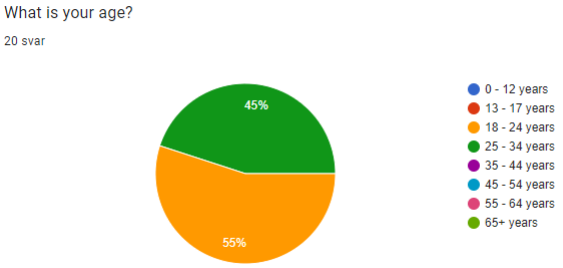


Figure 69: Age categorization of test participants

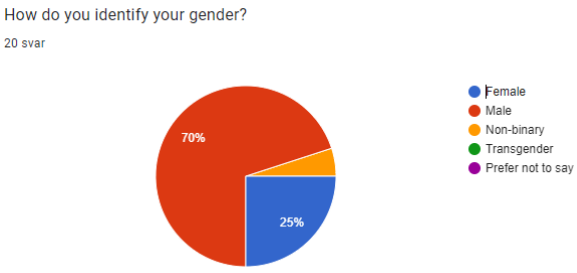


Figure 70: Gender categorization for test participants

A.12 Task for the Final test

1. Read the paper manual
2. Set one instrument and one drum block on the mother block.

3. Point out where the product tells you if a block is placed.
4. Get an effect on one of the blocks.
5. Press the play and pause buttons and adjust the volume and speed, and afterward reset the values
6. Go to the drum page and choose a new sound.
7. Change the type of instrument on an instrument block
8. Change reverb of the block with effect
9. Try to make the product play this sound (Ask for the sound, and help if necessary)

A.13 Interviews from the final test

A.13.1 First interview:

Speaker1: [00:00:01] So how intuitive was the translation between the physical world and the digital in our product?

Speaker1: [00:00:16] Would you say?

Speaker2: [00:00:20] Oh, it's hard to do in English when I have to describe it. Can you ask me one more time?

Speaker1: [00:00:32] Yeah, How intuitive was the translation between the physical world and the digital?

Speaker2: [00:00:40] I don't understand the question.

Speaker1: [00:00:43] Intuitive means how modern or what's the word?

Speaker3: [00:00:48] How easy did you find it? Between the blocks you put in the blocks on and seeing it here. So during the real part, we add blocks. And in the program. How intuitive did you find the whole use?

Speaker2: [00:00:59] At first, I thought it was a bit difficult. I couldn't see the connection between the physical and the digital. But when I experienced it and, you know, then understood it. It was quite easy. And. Yeah.

Speaker1: [00:01:30] There's no wrong answers.

Speaker2: [00:01:32] Okay.

Speaker1: [00:01:33] So how did the hands on blocks influence your overall experience? Did it improve it or make it worse, or?

Speaker2: [00:01:41] It improved it. Yeah. It was funny and easy. Yeah.

Speaker1: [00:01:49] So what feature did you find especially exploratory?

Speaker2: [00:01:57] I think the effect block was a very funny what's it called? Addition to the drums and the instrument block and. Yeah.

Speaker1: [00:02:14] So there's another question that kind of is the same. What aspects did you enjoy the most?

Speaker2: [00:02:22] I like the robot dancing, and I like that it was funny to try put together the music at the end of the trial. Yeah.

Speaker1: [00:02:39] So. And what aspects was challenging, frustrating about the product?

Speaker2: [00:02:49] I don't think it was frustrating, but it was a bit challenging to at first. Yeah. You know connect the the digital and the physical blocks. But when I just got started it was easy, I think or not easy, but. Yeah.

Speaker1: [00:03:18] In theory, if you were a middle school child again, would you use this as a musical instrument or play thing.?

Speaker2: [00:03:26] Yeah

Speaker1: [00:03:27] why?

Speaker2: [00:03:28] It was funny. And I think it's a funny you could even make it a game. I think it was like Yeah, a funny game. And the robot was really cute. And, yeah, it was, like, playful. Oh, what's it called? Yeah.

Speaker1: [00:03:48] Yeah, I'm just writing a quick notes here. Yeah. What factors, what factors would you say contributes most to the effectiveness of the tool for children?

Speaker2: [00:04:00] Which effect?.

Speaker1: [00:04:02] Now, what things in the product do you think has the most effect

would have the most effect on children?

Speaker2: [00:04:11] The physical blocks, I think. And then you have to slam it to want to go slam to, to get it started. Yeah, I think that's.

Speaker1: [00:04:25] And the last question and last but not least here, what would you like to see for future implementation if we had more time to work on this?

Speaker2: [00:04:40] I don't know if it could be any Clearer. But I didn't get it with these four. And you had to, like, put these two and these two. But you can also put these four on these two. I didn't get it.

Speaker1: [00:05:01] Yeah. Oh, okay.

Speaker2: [00:05:03] Yeah, that could be an improvement. Yeah.

Speaker1: [00:05:07] So make the stripes more apparent where you can put them. Yeah, yeah, that was kind of it. Thank you for that.

A.13.2 Second interview

Speaker1: [00:00:00] All right. So I'm just going to start right away. How intuitive was the translation between the physical world and the digital?

Speaker2: [00:00:10] It was a pretty good at first I was a little bit confused because I was expecting this block to be like, on top of the other one in the. Does that make sense? In the, in the, in the, in the game or whatever, what you call it. But other than that, I thought it was pretty understandable and like, well thought out. Yeah.

Speaker1: [00:00:32] How did how did the hands on blocks influence your overall experience?

Speaker2: [00:00:39] I can say it again.

Speaker1: [00:00:42] How did the hands on blocks the blocks influence your overall experience?

Speaker2: [00:00:47] Good fun. I think how Oh. I'm sorry.

Speaker1: [00:00:53] Oh, no. That's fine. You don't have anything else to say?

Speaker2: [00:00:55] No.

Speaker1: [00:00:56] What feature did you find? Especially especially exploratory.

Speaker2: [00:01:03] Yeah, I guess how you could mix together the different elements and such.

Speaker1: [00:01:10] What aspects did you enjoy most about the product?

Speaker2: [00:01:16] I think that the same as I just said, like being able to mix together all the things and experiment.

Speaker1: [00:01:24] What aspects was challenging, frustrating, slash frustrating about the product.

Speaker2: [00:01:31] Yeah. I think. No, not well. Other than that, the thing I mentioned at first. Yeah. But

Speaker1: [00:01:41] With not being able to place them. Right.

Speaker2: [00:01:44] Well, yeah. No, but thinking that if you when you place this one, like, on top of the other one, I thought it would come down on top. So I had to figure out where you could. I don't know if that makes sense.

Speaker1: [00:01:56] Come out down on top. Yeah.

Speaker2: [00:02:01] So I don't know if how I can explain it.

Speaker3: [00:02:07] He thinks it needs a second block here.

Speaker2: [00:02:09] Yeah.

Speaker1: [00:02:10] Yeah. Like a second? Yes. Okay. That was good enough. In theory, if you were a middle school child again, would you would. Do you think you would use this as a musical instrument slash toy?

Speaker2: [00:02:23] Would probably be fun.

Speaker1: [00:02:26] Yeah. What factors would you say contributes most to the effectiveness of the tool or product for children?

Speaker2: [00:02:38] Say that again.

Speaker1: [00:02:39] What things do you think if you say it another way, what things do you think contributes most to the effectiveness that this is for children? What things in the

product would you say?

Speaker2: [00:02:53] Yeah, I don't know. I'm sorry.

Speaker1: [00:02:55] Okay. You don't know. That's fine. And last but not least, what would you like to see for future implementation if you could decide?

Speaker2: [00:03:05] Yeah. I don't know. I'm sorry.

Speaker1: [00:03:09] No, it's all good. Yes, that's pretty much it.

A.13.3 Third interview

Speaker1: [00:00:00] Yes. So just we're just going to start. So how intuitive was the translation between the physical world and the digital?

Speaker2: [00:00:12] I think it was very intuitive with. Yeah, I think it was quite clear, what with the boxes represented also in 3D space. Yeah. And I mean, right now it's I cannot see the boxes that I have on, but I think it's because it's in it's been reset. But I remember it as that the boxes would also be placed on top of each other in. Yeah. On the display. Right. So like if I had this setup I have here.

Speaker1: [00:00:41] They would actually change color. They would change color. Yellow.

Speaker2: [00:00:44] Yeah exactly. So but I could see them. Yeah.

Speaker1: [00:00:48] Yeah. Okay, That's what you meant.

Speaker2: [00:00:49] Yeah.

Speaker1: [00:00:50] So how did the hands on block influence your overall experience?

Speaker2: [00:00:55] The physical box?

Speaker1: [00:00:57] Yes.

Speaker2: [00:00:58] I mean, I guess there's something very physical about placing them on top of each other as the metaphor of, like, adding more things to to the sound. That kind of makes sense if you want to, like, easily understand how this went from a basic sound to a more. Yeah, I don't know what. No. If complex is the right word, but just it was more add

ons. So yeah, I can see why. It's it's a good metaphor for understanding. Also, this has no effect, but this one has an effect because it has an extra block and so on. Yeah.

Speaker1: [00:01:39] Yeah, So what feature did you find especially exploratory?

Speaker2: [00:01:45] Especially exploratory. Good question. Never. Sure. Maybe just that I could change the sound on yeah. Like the different types of drums for the drum cube.

Speaker1: [00:02:06] No wrong answers. Yeah. So what aspect did you enjoy most about the product?

Speaker2: [00:02:20] I actually really liked that you had them physically that you could. Yeah, physically take them off and put new things on. You know, I think it's very nice.

Speaker1: [00:02:30] And what aspects was challenging slash frustrating about the product.

Speaker2: [00:02:36] I guess it was the fact that I could change instrument on the yellow greenish boxes. I did not get that. Yeah.

Speaker1: [00:02:47] Valuable data.

Speaker2: [00:02:49] Yeah.

Speaker1: [00:02:50] In theory, if you were a middle school child again, would you think you could. Would you use this as a musical instrument slash toy?

Speaker2: [00:02:58] I think it would be fun. I could see it as, like, a good introduction, I think. And Yeah. Just to play around it didn't feel, I don't know, it didn't feel too serious because it was very easy to get something that sounded nice. So yeah, in that way, I think it, it would be good. Yeah.

Speaker1: [00:03:17] What factors would you say contributes mostly to the effectiveness of the tool for children?

Speaker2: [00:03:25] To the effectiveness. I'm not sure. I'm not sure what kind of effectiveness you're thinking of.

Speaker1: [00:03:35] Well, what would you think?

Speaker2: [00:03:39] I don't know if it's If I could get. Yeah, if I could use it, I guess, get the desired thing out of it. Yeah, I don't know. I think it's it's good. Okay.

Speaker1: [00:04:03] We don't have anything else, then. Oh, yeah. Last but not least, what would you like to see for future implementation if you had to design anything?

Speaker2: [00:04:13] I think it would maybe just add new boxes instead of having to change instrument on the yellow ones, that it was just new cubes and new colors, for example, for the trumpet and such.

Speaker1: [00:04:26] Yeah, that was pretty much it. Yeah. Thank you.

A.13.4 Fourth interview

Speaker2: [00:00:02] Yeah, I mean we're just going to start. How intuitive was the translation between the physical world and the digital?

Speaker1: [00:00:12] I feel like it was very on the nose. It wasn't too different and it was very easy to see if things were matching. So I feel like it was very intuitive.

Speaker2: [00:00:22] It felt very it felt it was very intuitive. Yeah.

Speaker1: [00:00:25] I feel like it's you really kind of you point a point B, they're very much the same. So yeah.

Speaker2: [00:00:34] How did the hands on block influence your overall experience?

Speaker1: [00:00:38] How did the hands on block? Well. In the sense of it's, how do I say this? It's easy to use. So that kind of made it so that since it was pretty easy to use, it kind of made it very easy to handle and it kind of I didn't feel stressed too much using it. Yeah.

Speaker2: [00:01:11] I mean, no wrong answers here. Yeah.

Speaker1: [00:01:12] So.

Speaker2: [00:01:14] So what features did you find especially exploratory, what a fancy word.

Speaker1: [00:01:20] I personally don't have much experience with making music, but I liked that it had various options for music and things like that. So. And it's very customizable, which is very nice.

Speaker2: [00:01:36] Yeah. So what aspects did you enjoy most about the product?

Speaker1: [00:01:42] Probably the very it's very open ended. Like I can kind of do what I

want and doesn't, like, keep me locked in, if that's the way to put it. Yeah. So there's a lot of freedom with it. Yeah.

Speaker2: [00:02:02] So what aspects on the other hand then what aspects were challenging slash frustrating about it.

Speaker1: [00:02:09] I guess. Can't say I was really frustrated by anything. It was a rather pleasant experience.

Speaker2: [00:02:23] So you could also say challenging. That helps.

Speaker1: [00:02:27] I mean yeah, it was of course I had to reread and everything just to see how it should start. But once I have read it and I did it the first time it was it made sense and it worked. So yeah.

Speaker2: [00:02:42] So let's say in theory, you're a middle school child again. Do you think that you would use this as a toy or a learning instrument? Would have. That's a better phrasing.

Speaker1: [00:02:56] What age group is middle school here in Denmark?

Speaker2: [00:02:58] It's 9 to 12.

Speaker1: [00:02:59] Oh, okay. Yeah, because for me, middle school is like 13 to 15. Yeah. I think it'd be a good start. One. Yeah. And then then you could obviously move on to a, like a, like a real stringed instrument or something after drums. So personally I wouldn't because I already did play instruments before, so. But I could see there's merit in it. Yeah. Yeah.

Speaker2: [00:03:26] What factors would you say contribute mostly to the effectiveness of the tool for children i.e. what do you think of the product that was best at contributing to this for kids.

Speaker1: [00:03:39] I think just like the colors and how it's very you know, like blocks and building blocks that's very, like, recognizable for, for kids. So I feel like that's the main thing. The aesthetic is nice and simple. Doesn't really confuse you too much. Yeah.

Speaker2: [00:04:01] Yeah. And last but not least, what would you, if you could decide? What would you think? What would you like to see for future implementation if you had more time?

Speaker1: [00:04:11] For future implementation. I think maybe just probably having a bit more instruments. And yeah. Otherwise, I think it's very nice looking and like the look of it is good, but I think just a bit more options maybe. Yeah. So. Yeah. Like what? Well, because what was it there was for example, for this, there was a piano trumpet. And there was one more, I don't really remember

Speaker2: [00:04:47] guitar.

Speaker2: [00:04:48] And guitar. Yeah. I didn't really play much with the guitar, but there's, I mean, like, if you just take trumpets, there's like 30 different instruments that like that. Okay. In that sense. Yeah. So and for like maybe more stringed instruments because like I used to play the violin. So that might be something that could be interesting. So.

Speaker2: [00:05:15] Yeah. Totally. I think that was it.

Speaker1: [00:05:18] All right. Cool. Yeah.

Speaker2: [00:05:19] Thank you.

Speaker1: [00:05:20] Of course.

A.13.5 Fith interview

Speaker1: [00:00:01] There we go. So I'm just going to start. How intuitive did you think the translation between the physical world and the digital world was in our product?

Speaker2: [00:00:12] I think it was very well integrated, like I was looking through the screen and the blocks to see if anything matched up. And Yeah, the right block showed up. So, yeah, I think it worked pretty well.

Speaker1: [00:00:26] Yeah. How did the hands on block influence your overall experience?

Speaker2: [00:00:32] I, I thought it was fine. The interesting way to do it. Not something I was, like, over the moon about, but I thought it was a very cool idea.

Speaker1: [00:00:45] Why weren't you over the moon about it?

Speaker2: [00:00:47] It's like I like the, I think I maybe just needed like. Maybe I needed to do more with the blocks for me to get a sense of it because for me it was just like all right, we set it up and then most of it was done there. So I felt like it was more maybe communicating

back and forth. That probably made me think, oh, I really like seeing where these blocks go. Yeah, yeah.

Speaker1: [00:01:11] Okay. So but if you could add, i mean what features did you find especially exploratory?

Speaker2: [00:01:21] Definitely the blocks things they're, they're start to just see like all right. This in what sort of sounds putting it in in the first place. Seemed very cool to just see. Yeah. I think yeah. Just putting the blocks out for the first time and see how it came to the screen.

Speaker1: [00:01:43] Yeah. What aspects did you enjoy most about the product?

Speaker2: [00:01:49] Definitely the whole process of yeah. Making different effects and sounds after you put down the blocks. That was really fun to just see what would come out of a press a certain button. Yeah.

Speaker1: [00:02:05] What aspects was challenging slash frustrating about the product?

Speaker2: [00:02:11] I wouldn't say there was anything like challenging. I would say I think maybe just getting. Yeah, a little bit more like, press this button, press this button to just get the overall vibe in the product would maybe make me a little bit more like, oh, I see it now, where for me, it was just like, oh, I had to maybe go to the back to see, oh, what's that thing on like the paper manual.

Speaker1: [00:02:36] Yeah, yeah, yeah. In theory, let's say you were a middle school child again. 9 to 12. Would you think you could would you have used this thing as an instrument toy if you're 9 to 12 again?

Speaker3: [00:02:50] Yeah, I think I probably would.

Speaker2: [00:02:52] Yeah. It's a very interesting concept and I could definitely see someone in that age probably thinking that. Yeah, it would be a very interesting way to like, learn music theory in that. So yeah. Yeah.

Speaker1: [00:03:06] What factors would you say contributes mostly to the effectiveness that this is made for children?

Speaker2: [00:03:13] I think the whole block thing like it could easily just be like okay, you learn all about the whole music aspect of it beforehand. But so like just boil it down to like

blocks you put up on top one another and then it makes like a sound. That seems like a very interesting idea.

Speaker1: [00:03:32] And last but not least here, what would you like to see for future implementation.

Speaker2: [00:03:37] Yeah. Maybe like a little bit more in between with the whole like blocks, computer blocks, computers. So like see anything like maybe mid sequence you can like add different stuff, things to see what happens. And yeah just a little bit more back and forth that would be like really cool.

Speaker1: [00:03:55] To do you mean by back and forth.

Speaker2: [00:03:57] So like oh yeah I have this thing on and then I could put this, this, this on and then maybe just add more to it. I think, like, I don't know how to explain it. Yeah.

Speaker1: [00:04:09] Can you try?

Speaker2: [00:04:10] Yeah, sure. Maybe essentially, if I have it here, I'm very willing and want to, like, make something, but just like. Maybe I just want to, like, add more and more and more to it. So it's like, oh, hey, I can maybe just go here, here, here, maybe try that, see how that goes. And then maybe like, yeah, I don't know. It's weird. It's weird. Okay.

Speaker1: [00:04:34] But I think that was pretty much it.

Speaker2: [00:04:36] Yeah, sure.

Speaker1: [00:04:36] So thank you.

Speaker2: [00:04:37] Of course.

A.14 Demographic Questionaire

https://docs.google.com/forms/d/e/1FAIpQLSf-G7XxOjEc6bG9AnqmdiQjjMAavVt7mbMQRvJ_lGz-YSU_1A/viewform

What is your age?

- 0 - 12 years
- 13 - 17 years

- 18 - 24 years
- 25 - 34 years
- 35 - 44 years
- 45 - 54 years
- 55 - 64 years
- 65+ years

How do you identify your gender If you prefer to self describe, choose the other and write your gender. If you'd prefer not to share, that's perfectly fine.

- Female
- Male
- Non-binary
- Transgender
- Prefor not to say
- other

In your opinion, how much experience do you have creating music?

[Not at all] 1 - 5 [Very experienced]

A.15 SUS + User engagement Questionnaire

https://docs.google.com/forms/d/e/1FAIpQLSfWMoBXOvFQrWlRimVOWrF_52KEvqciKbeZGqzW1jK1ZYLr
viewform?usp=sf_link

A.15.1 Section 1:

Post-Session Questionnaire

Thank you for trying our product, before you go please answer this survey. The survey involved your experience with our product using two well-known tools: the System Usability Scale (SUS) to measure user-friendliness, and a User Engagement Scale to gauge your involvement and interest. Your feedback will help us understand how usable and engaging our

product is.

A.15.2 Section 2:

SUS scale questionaire

1. I Like to use this system freguently

[Strongly disagree] 1 - 5 [Strongly agree]

2. I find this system to be more complicated than it should be

[Strongly disagree] 1 - 5 [Strongly agree]

3. I think the system is simple and easy to use

[Strongly disagree] 1 - 5 [Strongly agree]

4. I need technical support to use this system

[Strongly disagree] 1 - 5 [Strongly agree]

5. I find the system functioning smoothly and is well-integrated

[Strongly disagree] 1 - 5 [Strongly agree]

6. I think there are a lot of irregularities in the system

[Strongly disagree] 1 - 5 [Strongly agree]

7. I think most people can learn this system quickly

[Strongly disagree] 1 - 5 [Strongly agree]

8. I find this system to be time-consumming

[Strongly disagree] 1 - 5 [Strongly agree]

9. I feel confident while using this system

[Strongly disagree] 1 - 5 [Strongly agree]

10. I think there are a lo of things to learn before I can start using this system

[Strongly disagree] 1 - 5 [Strongly agree]

A.15.3 Section 3:

User Experience Questionaire

1. I lost myself in this experience
    - Strongly disagree
    - Disagree
    - Neither agree nor disagree
    - Agree
    - Strongly agree
2. the time i spent on the product just slipped away
    - Strongly disagree
    - Disagree
    - Neither agree nor disagree
    - Agree
    - Strongly agree
3. I was absorbed in this experience:
    - Strongly disagree
    - Disagree
    - Neither agree nor disagree
    - Agree
    - Strongly agree
4. I felt frustrated while using the product:
    - Strongly disagree
    - Disagree
    - Neither agree nor disagree

- Agree
- Strongly agree

5. I found the product confusing to me:
    - Strongly disagree
    - Disagree
    - Neither agree nor disagree
    - Agree
    - Strongly agree
6. Using this product was taxing:
    - Strongly disagree
    - Disagree
    - Neither agree nor disagree
    - Agree
    - Strongly agree
7. The product was attractive:
    - Strongly disagree
    - Disagree
    - Neither agree nor disagree
    - Agree
    - Strongly agree
8. The product was aesthetically apealling:
    - Strongly disagree
    - Disagree
    - Neither agree nor disagree

- Agree
- Strongly agree

9. This product appealed to my senses:
    - Strongly disagree
    - Disagree
    - Neither agree nor disagree
    - Agree
    - Strongly agree
10. Using the product was worthwhile:
    - Strongly disagree
    - Disagree
    - Neither agree nor disagree
    - Agree
    - Strongly agree
11. My experience was rewarding:
    - Strongly disagree
    - Disagree
    - Neither agree nor disagree
    - Agree
    - Strongly agree
12. I felt interested in this experience:
    - Strongly disagree
    - Disagree
    - Neither agree nor disagree

- Agree
- Strongly agree

A.16 Observations and Pilot test results from Usability Test 1

Pilot Test

- We need to say our program has a delay so the test participants dont get confused
- Put the numbers back that shows the values of the numbers so its easier for us to debug while testing
- Question 4 needs to be changed so it also changed the speed value.
- Question 2 needs to be changed so its only the 2 blocks that needs to be put forth.
- Needed to change the volume slider script as it didnt work as intended
- Question 1 needed to be changed so they need to say aloud what they think the blocks do.
- Question 2 needs to say that the blocks need to be put on different PinOut

Participant 1

- Thinks the yellow is a piano, the red is some noise/radio. He thinks the blue is a note, a specific note like C/D/E, etc.
- He sets them up without problems. He has to press the drum to get it to work.
- He places it on the music block, effect block.
- Does it without problems, says it would be great to have volume and speed controls; a click on it sets it to standard speed and volume.
- Does it without problems. Finds the music a bit low, confused about the names.
- Finds the music a bit low.
- Does it without problems, but also uses distortion.

Participant 2

- Thinks the yellow is a piano. He thinks the blue is the volume. He thinks the red is a drum.
- He does it without problems, but has trouble with which block will be shown, has to press it to see the results.
- He places the blue on the instrument block without problems. Says its a dark color.
- Does it without problems.
- Thinks that changing the instrument means changing the cube itself. He right-clicks and is confused about why the music doesnt change. Though, each block was coded for different sounds.
- Does it but feels the drum sounds are very low.
- Thinks that the knobs should be pressed directly, maybe better to use a slider.

Participant 3

- Thinks the red is a drum. The yellow is a piano. Doesnt know about the blue.
- He does it without problems, but the drum block has a problem displaying, so its has to made heavier.
- He does it without problems, but the instrument block doesnt appear. It takes a long time for something to happen, even though the values are correct nothing shows up.
- He does it without problems.
- Left-clicks by mistake. Wants to be able to see which one is selected. Wants to be able to change the instrument within the menu itself.
- Does it without problems
- Does it without problems

Participant 4

- The red is a drum block, the yellow is a piano, the blue he thinks is some kind of sound.
- Does it without problems.
- Does it without problems.

- Does it without problems.
- Thinks he has to switch the blocks instead of pressing it. Make the text a bit clearer.
- Does it without problems.
- Does it without problems.

Participant 5

- Thinks the different blocks should play sound.
- Places them on top of each other, changes it to placing them individually.
- Does it without problems.
- Does it without problems.
- Thinks that changing the instrument means changing the blocks. A bit confused about how to change the instrument, thinks after right-clicking the sound will change.
- Confused about why theres an M on the drum. Does it otherwise without problems.
- Does it without problems, a bit confused about where to press to get into effects.

A.17 Observations and Pilot test results from Final test

Pilot Test

1. We need to showcase that that the manual is the physical manual, not the one on screen, or the paper task one
2. We need to say they gotta do a think aloud
3. In the manual it says motherblock, in the task it says mainblock.
4. Change the type of instrument task needs to be changed, so they need to change instrument, not the block
5. You need to not be able to right click to change instruments
6. We need to say that people can get help in task 9
7. In theory, if you were a middle school child again would you use this as a musical instrument?. Changed the question to this

Participant 1

1. Does it without any issues.
2. Does it without any issues. Although problems with the box's measurement.
3. Does it without any issues. Confused about the strips on the blocks themselves, thought they meant they were different.
4. Does it without any issues.
5. Does it without any issues. Although problems with the box's measurement.
6. Does it without any issues.
7. Does it without any issues.
8. Does it without any issues.
9.

Participant 2

1. Does it without any issues.
2. Does it without any issues. Although problems with the box's measurement. Confused about the strips on the blocks themselves, thought they meant they were different.
3. Does it without any issues. Although problems with the box's measurement.
4. Does it without any issues.
5. Does it without any issues.
6. Does it without any issues.
7. Thinks changing the sound is the same as changing the instrument.
8. Confused on how to get to effects
9.

Participant 3

1. Does it without any issues.

2. Does it without any issues. Confused about the strips on the blocks themselves, thought they meant they were different.
3. Does it without any issues. Although problems with the box's measurement.
4. Does it without any issues.
5. Does it without any issues.
6. Confused about what drum page means. Does it without any issues.
7. Thinks changing the sound is the same as changing the instrument. Thinks you change instrument by changing the boxes
8. Does it without any issues. Cant find the effect panel.
9. There is a problem with, if an instrument canvas is opened and an effect block is added to that instrument, the first canvas does not close.
10.

Participant 4

1. Does it without any issues.
2. Does it without any issues. Confused about the strips on the blocks themselves, thought they meant they were different.
3. Does it without any issues. Although problems with the box's measurement.
4. Does it without any issues.
5. Does it without any issues.
6. Bit confused on how to do it. uses the manual then does it without any issues.
7. Thinks you change instruments by going and changing the boxes. Does it without any issues.
8. Doesnt know what reverb means, doesnt think you can press the icons
9. There is a problem with, if an instrument canvas is opened and an effect block is added to that instrument, the first canvas does not close.

Participant 5

1. Does it without any issues.
2. Does it without any issues. A little problem with the blocks not being registered. Confused about the strips on the blocks themselves, thought they meant they were different.
3. Does it without any issues.
4. Does it without any issues., a little problem with the blocks not being registered.
5. Does it without any issues.
6. Does it without any issues.
7. Thinks changing the sound is the same as changing the instrument.
8. Don't know what "reverb" means, a bit unsure how to get in there.
9. There is a problem with, if an instrument canvas is opened and an effect block is added to that instrument, the first canvas does not close.
10.

Participant 6

1. Does it without any issues.
2. Does it without any issues. Although problems with the box's measurement.
3. Does it without any issues.
4. Does it without any issues.
5. Does it without any issues.
6. Does it without any issues.
7. Thinks changing the sound is the same as changing the instrument.
8. Does it without any issues.
9.

Participant 7

1.
2. Does it without any issues.

3. Does it without any issues. Confused about the strips on the blocks themselves, thought they meant they were different.
4. Does it without any issues.
5. Problems with the blocks not registering
6. Does it without any issues.
7. Does it without any issues.
8. Thinks changing the sound is the same as changing the instrument. Uses the infobutton to figure it out
9. Cant find the effect panel.
10. There is a problem with, if an instrument canvas is opened and an effect block is added to that instrument, the first canvas does not close.

Participant 8

1. Does it without any issues.
2. Some problems with the blocks not being registered, but otherwise manages it. Confused about the strips on the blocks themselves, thought they meant they were different.
3. Does it without any issues.
4. Again problems with the blocks not being registered, otherwise no problems.
5. Does it without any issues.
6. Does it without any issues.
7. Thinks changing the sound is the same as changing the instrument.
8. Does it without any issues.
9. There is a problem with, if an instrument canvas is opened and an effect block is added to that instrument, the first canvas does not close.

Participant 9

1. Does it without any issues.

2. Think you can put them on top of each other. Confused about the strips on the blocks themselves, thought they meant they were different.
3. Does it without any issues.
4. Does it without any issues.
5. Does it without any issues.
6. A bit confused about how to access the menu, but read it and he manages.
7. Think he changed the instrument, not the sound, by changing the sound. Does it eventually.
8. Don't know where the reverb button is.

Participant 10

1. Does it without any issues.
2. Does it without any issues. Although problems with the box's measurement.
3. Does it without any issues.
4. Does it without any issues.
5. Not sure how to reset the values, otherwise it does without problems.
6. Does it without any issues.
7. Thinks changing the sound is the same as changing the instrument.
8. Doubts about how it works, think the block must be physically put on.
9. There is a problem with, if an instrument canvas is opened and an effect block is added to that instrument, the first canvas does not close.

Participant 11

1. Does it without any issues.
2. Putting the effect block on, confused about how to do it. Problems with the box's measurement.
3. Does it without any issues.

4. Does it without any issues.
5. Going to change the volume and the sound inside the menu itself on the instrument block.
6. Does it without any issues.
7. Thinks changing the sound is the same as changing the instrument.
8. Cant find the effect panel.

Participant 12

1. Thinks the manual is the paper manual with the tasks
2. Places the drum and instrument block on top of each other.
3. Does it without any issues.
4. Does it without any issues.
5. Does it without any issues.
6. Confused about where to press, but reading the information, he can.
7. Thinks changing the sound is the same as changing the instrument. use the information page to find out.
8. Confused about how to change the effect, can't find the Go To Effects Button. Confused about what reverb is and don't understand the submarine and the church mean reverb functions.
9. There is a problem with, if an instrument canvas is opened and an effect block is added to that instrument, the first canvas does not close.

Participant 13

1. Does it without any issues.
2. Does it without any issues. Problems with the box's measurement.
3. Does it without any issues
4. Does it without any issues
5. Does it without any issues

6. Does it without any issues
7. Thinks changing the sound is the same as changing the instrument.
8. Does it without any issues.

Participant 14

1. Does it without any issues
2. Does it without any issues
3. Does it without any issues
4. Does it without any issues
5. Does it without any issues
6. Does it without any issues
7. Thinks you change instrument by changing the boxes
8. Does it without any issues
9. There is a problem with, if an instrument canvas is opened and an effect block is added to that instrument, the first canvas does not close.

Participant 15

1. Does it without any issues
2. Thinks the effect block is the instrument block
3. Does it without any issues
4. Does it without any issues
5. Does it without any issues
6. Does it without any issues
7. Thinks you change instrument by changing the boxes
8. Does it without any issues
9.

Participant 16

1. Thinks the manual is the paper manual with the tasks
2. Does it without any issues. Problems with the box's measurement.
3. Does it without any issues
4. Does it without any issues
5. Does it without any issues
6. Does it without any issues
7. Thinks changing the sound is the same as changing the instrument.
8. Does it without any issues, bit in doubt where to press
9. There is a problem with, if an instrument canvas is opened and an effect block is added to that instrument, the first canvas does not close.

Participant 17

1. Does it without any issues
2. Does it without any issues, thinks you only need to put one on. Confused about the strips on the blocks themselves, thought they meant they were different.
3. Does it without any issues
4. Does it without problems, think the lines matter though, the more lines only match with more lines.
5. Don't quite know what speed visuals are. Otherwise do it without problems
6. Does it without any problems. however, have doubts about what the sliders do inside the menu.
7. Thinks you change instrument by changing the boxes
8. Does it without any problems.
9. There is a problem with, if an instrument canvas is opened and an effect block is added to that instrument, the first canvas does not close.

Participant 18

1. Does it without any issues

2. Does it without any issues
3. Does it without any issues
4. Does it without any issues
5. Does it without any issues
6. Does it without any issues
7. Thinks you change instrument by changing the boxes
8. Does it without any issues
9. There is a problem with, if an instrument canvas is opened and an effect block is added to that instrument, the first canvas does not close.

Participant 19

1. Does it without any issues
2. Does it without any issues
3. Does it without any issues
4. Misunderstands what the idea of "get an effect" is. Don't think anything happens when it changes colour, the color isn't striking enough.
5. Does it without any issues
6. Think going to the drum page means the physical manual. Confused about pressing the box itself.
7. Thinks changing the sound is the same as changing the instrument.
8. Don't know what "reverb" means. Don't know what to do without help. When the person is on the loss of effect she still does not know what to do. Confused about how reverb works.
9.

Participant 20

1. Thinks the manual is the paper manual with the tasks.
2. I think you should put them on top of each other.

UES-SF Scores for Each Participant:

	Participant	Focused Attention	Perceived Usability	Aesthetic Appeal	Reward Factor	Overall Engagement
0	P1	4.333333	4.000000	4.000000	4.333333	4.166667
1	P2	4.000000	3.666667	4.666667	4.000000	4.083333
2	P3	3.666667	4.666667	3.666667	4.000000	4.000000
3	P4	4.666667	5.000000	5.000000	5.000000	4.916667
4	P5	3.666667	4.333333	3.666667	4.000000	3.916667
5	P6	3.666667	2.666667	3.333333	4.000000	3.416667
6	P7	4.000000	5.000000	4.333333	4.333333	4.416667
7	P8	3.333333	4.333333	3.666667	4.666667	4.000000
8	P9	3.666667	3.666667	3.000000	3.333333	3.416667
9	P10	4.000000	4.333333	3.333333	4.333333	4.000000
10	P11	4.000000	4.666667	4.000000	4.000000	4.166667
11	P12	3.666667	3.000000	4.000000	3.333333	3.500000
12	P13	3.333333	3.666667	2.666667	3.666667	3.333333
13	P14	2.333333	2.333333	4.000000	3.333333	3.000000
14	P15	2.666667	4.000000	3.333333	4.000000	3.500000
15	P16	3.666667	3.666667	4.333333	4.333333	4.000000
16	P17	2.333333	2.333333	3.333333	2.666667	2.666667
17	P18	3.666667	3.000000	4.000000	4.333333	3.750000
18	P19	3.000000	4.000000	3.666667	3.333333	3.500000
19	P20	2.666667	5.000000	3.333333	4.000000	3.750000

Figure 71: The full raw data for UES scores

3. Does it without any issues
4. "Get an effect", misunderstands that to get an effect you have to put things on, not "put a block on".
5. Doing it fine, but misunderstanding what the arrow does, aka the reset.
6. Do it without any problems. The hihat sound doesn't work though.
7. Thinks changing the sound is the same as changing the instrument.
8. There is a problem with, if an instrument canvas is opened and an effect block is added to that instrument, the first canvas does not close.
9.

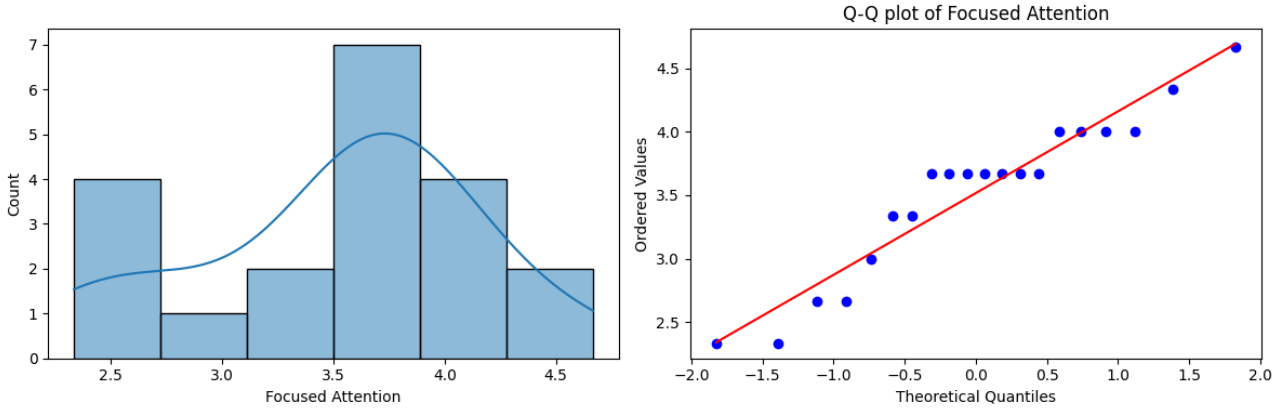


Figure 72: Focused Attention Density and Q-Q plot

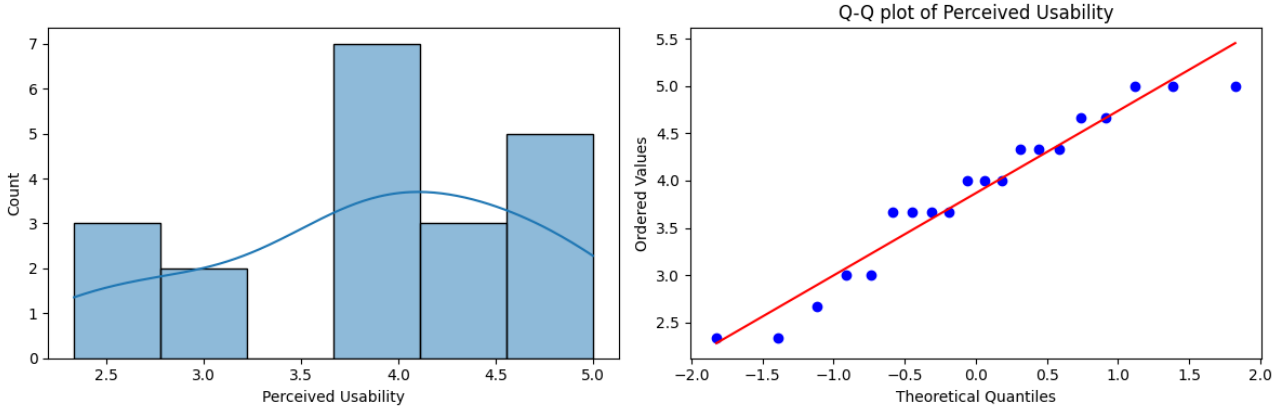


Figure 73: Perceived Usability Density and Q-Q plot

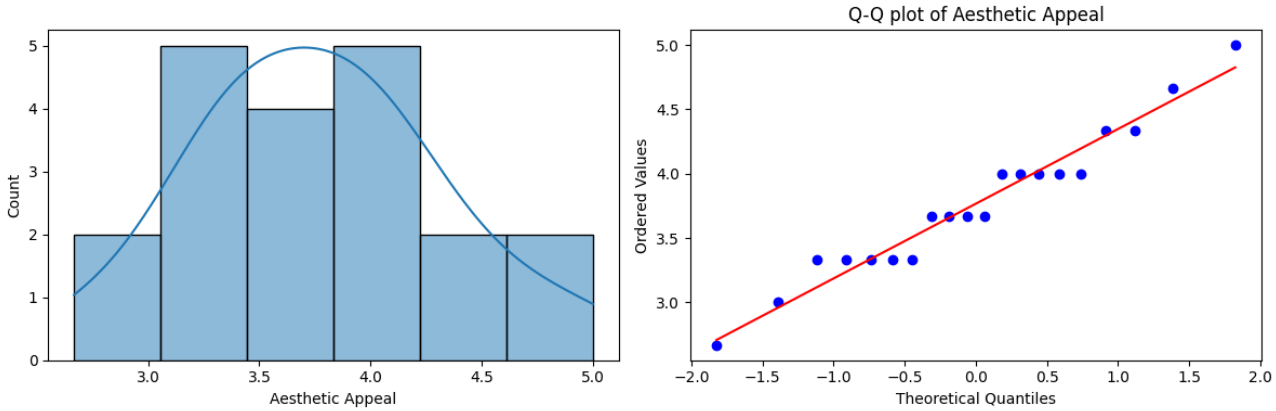


Figure 74: Aesthetic Appeal Density and Q-Q plot

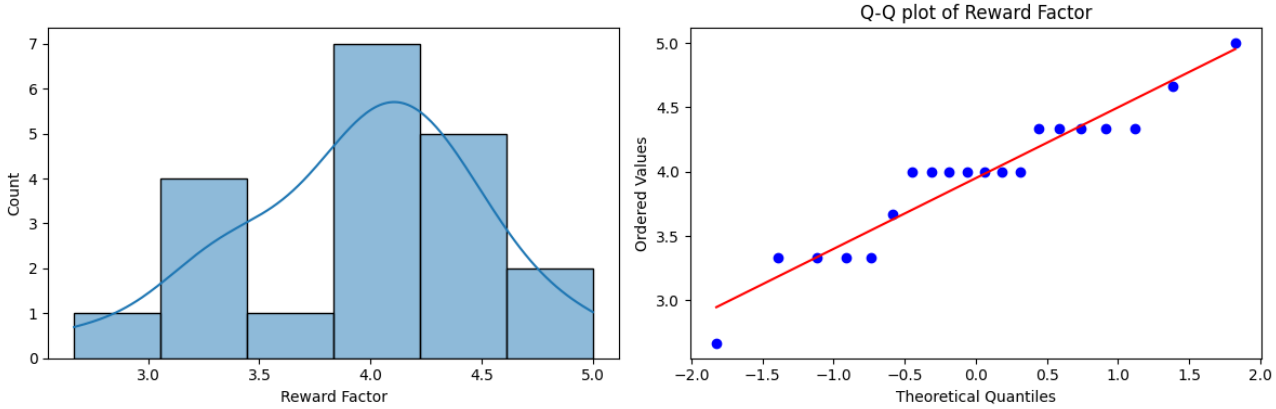


Figure 75: Reward Factor Density and Q-Q plot

A.18 UES-SF Scores for Each Participants

A.19 Density and Q-Q plot for each of the sub scales

A.20 Collaborative learning

Listed by [D. W. Johnson and R. T. Johnson 1989] and [Panitz 1999], this paper [Laal and Ghodsi 2012] summarizes and categorizes them into 4 different categories and is what this paper is using.

Collaborative learning is an approach to education that covers the idea that multiple people work together on a project/task, in such a way that an improved way of learning and skill gain is achieved. Through understanding the appeal of collaborative learning (CL), it can be used to argue for the use of this learning method, and also shape a product around those specific parameters. It is to be noted that these parameters focus on student collaboration.

Social Benefits

- CL helps to develop a social support system for learners;
- CL leads to building diversity and understanding among students and staff
- CL establishes a positive atmosphere for modeling and practicing cooperation;
- CL develops learning communities.

Psychological benefits

- Student-centered instruction increases students' self-esteem;
- Cooperation reduces anxiety
- CL develops positive attitudes toward teachers

Academic benefits

- CL Promotes critical thinking skills
- Involves students actively in the learning process
- Classroom results are improved
- Models appropriate student problem-solving techniques

- Large lectures can be personalized
- CL is especially helpful in motivating students in specific curriculum
- Collaborative teaching techniques utilize a variety of assessments.

The term "collaborative learning" refers to a teaching strategy in which students collaborate to complete assignments or projects that improve their knowledge and abilities. Through increased critical thinking and active participation, CL improves academic performance. It also fosters social connections by building supportive learning communities and promoting understanding among varied groups. Psychologically, CL helps students feel more confident in themselves, feel less anxious, and develop good attitudes toward their teachers. Overall, it has been demonstrated that incorporating collaborative learning practices greatly enhances the educational process and promotes an inclusive, productive, and supportive academic atmosphere. [D. W. Johnson and R. T. Johnson 1989]

A.21 Sounds from the program, found on samplefocus.com

This is their link to its Standard License: https://samplefocus.com/license

Trumpet loop by Oderwas

https://samplefocus.com/samples/trumpet-loop

Clean Synth Acoustic Guitar Chords By Djblacknto TAbney

https://samplefocus.com/samples/clean-synth-acoustic-guitar-chords

summer time lofi piano By user721069629056

https://samplefocus.com/samples/summer-time-lofi-piano

guitar loop By Bendji

https://samplefocus.com/samples/guitar-loop-140

Mixed Acoustic Guitar Melody - "Lush" by WavySeal

https://samplefocus.com/samples/mixed-acoustic-guitar-melody-lush

A.22 Explanation of pure-data integration

The signal shaping consist of the ’line ’ that shape the initial signal, that is a ramp signal that interpolates linearly over time. Then the ’sqrt t’ take the square root of it, that is then

multiplied by 20 to scale the amplitude. The ' - 0.25' gives an offset, that effect the phase of the waveform that the signal is. The 'cos t' transform the signal to follow the cos curve, and lastly a low-pass filter is used to filter out any frequency over 1000.

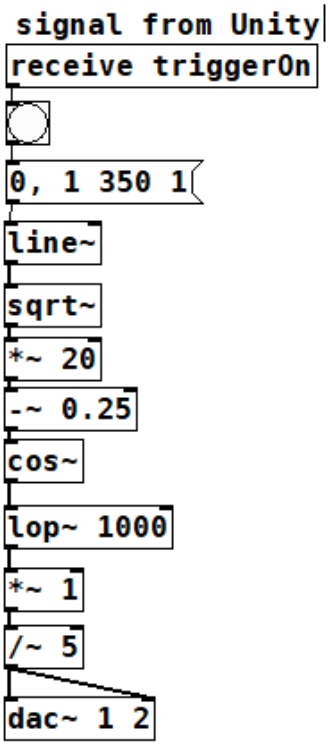


Figure 76: BassDrum Setup in PureData

It can be seen that the first component is the [receive triggerOn], which is a global receiver that gets activated when Unity sends the triggerOn Bang.

For the interaction between Unity and PureData, a library called Lib Pd is used. It is used by adding it as an instance to the Unity project, where it can be added to a GameObject

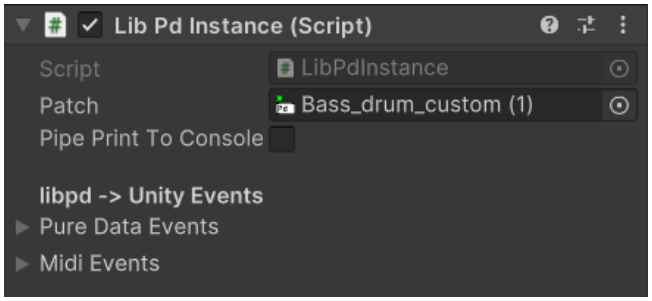


Figure 77: How the Lib Pd is setup in Unity GameObject

We have then added this to a button object, together with a trigger component that contains

the script to send the data to the PureData patch.

```
1 reference
public Slider slider;
2 references
public LibPdInstance pdPatch;
1 reference
public Button button;

0 references
void Start()
{
    button.onClick.AddListener(OnClick);
}

1 reference
void OnClick()
{
    float sliderValue = slider.value;
    pdPatch.SendFloat("sliderValue", sliderValue);
    pdPatch.SendBang("triggerOn");
}
```

Figure 78: Code of the script for interaction between Unity and PureData

It can be seen that the 'triggerOn' that gets sent is the same that the PureData patch catches, and starts the sound loop.

This 'triggerOn' only send via a button press, but since a button is only On / Off, there could still be a need to have a range based value change, though the use of Unity UI slider component, therefore the 'SendFloat("sliderValue")' is added, that works the same way as the buttons, but sends a float each 'OnClick' meaning each you interact with it.

A.23 Different interactions of block-size

Mother-Block

1. Height: 36 mm Width: 123.7 mm - First design
2. Height: 46 mm Width: 153.6 mm - Second design
3. Height: 56 mm Width: 183.4 mm - Final design

Blocks:

1. Height: 36 mm Width: 36 mm - First design
2. Height: 46 mm Width: 46 mm - Second design
3. Height: 56 mm Width: 56 mm - Final design

A.24 Comparing the results in precision test one

When comparing the use of a hand to put pressure on the blocks, interesting results can be seen. First for the drum-block (R), it can be seen that the mean and media values were fairly consistence, but it can also be seen that the σ shows a difference in the fluctuation between the two measurements.

UNITY R and R W Hands:	
mean	3.750000
median	10.000000
std	-4.823158
min	0.000000
max	-5.000000

Figure 79: Drum-block (R) measurements with and without hands

For the instrument blocks (Y1 & Y2) a different pattern can be observed, that is that the difference in the mean and median for measures with and without hands have higher impact.

UNITY Y1 and Y1 W Hands:	
mean	30.871212
median	37.500000
std	1.804616
min	15.000000
max	25.000000

UNITY Y2 and Y2 W Hands:	
mean	9.166667
median	12.500000
std	0.623744
min	5.000000
max	10.000000

Figure 80: Instrument-block (Y1 & Y2) measurements with and without hands

To visualize the data, box-plots have been made, these show the distribution of the data, by summarize the data into a concise visual format. This is without the non-registered data-points