

Mobile Application Design of *Musices*: Music Composition is not out of Reach

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1 Analysis

1.1 Problem Description

1.1.1 Background of the Problem

The content of music lessons in secondary schools is very limited. The Give-a-Note Foundation did surveys on what types of music curricular and co-curricular music classes were offered in elementary and secondary schools from nationally representative sample of 468 teachers. “The most common music course offerings are the traditional ensembles of band, chorus, and orchestra, and their variations (such as marching band or show choir). This is evident across elementary, middle, and high schools, although non-ensemble ‘general music’ is the single most common offering in elementary schools. At the middle school level, band (91%) and choir or chorus (83%) were, by far, the most common music courses offered at schools that employed at least one music teacher. General music is available at 56% of middle schools and orchestra or string ensemble is offered at 41% of middle schools. Less common middle school music offerings include jazz band (19%), individual instrument lessons (18%), music appreciation (9%), guitar ensemble (7%), piano (6%), music theory (5%), and show choir (4%)” (2017). Music composition has not even become a category in the survey. However, “given the 2014 Music Standards emphasis on Creating music and Responding to music as co-equal learning goals to Performing music, it is possible that music educators teaching traditional ensembles may begin to innovate *within* ensemble structures to make music education more comprehensive, by including elements of music Creation and Response” (2017). The latest music education standards changed in 2014,

schools and teachers need to update their education concepts and teaching tools in order to help students achieve learning goals.

Every school values music education differently. Many factors contribute to the inconsistency of music education in schools. For example, schools may have limited budget to provide learning materials for band or instrument class. “Music education is not an inexpensive offering for schools and districts. Math classes can be taught with pencils and paper. English classes with books that, while not free, aren’t tapping into the prices that a violin, piano or cello can cost a school. Then there’s the upkeep — maintaining instruments is also a budget line that schools need to consider” (Barack, 2018). Then school has to cut off music class or make music class as an elective class for students to choose.

However, some schools and scholars believe that music education is very important for children’s development in many ways. Music education is always a part of educational curricula in elementary and secondary schools. Music composition represents the form and content of music creation as part of music learning and teaching. The fields of philosophy and sociology examined the relationship between human and music. “Evidence emerging from studies in neuroscience suggests that closer attention to the interactions of mind and body illuminate the human need to create, and by extension, our need to create music” (Kashub, 2009). Students who want to create music may not know what to use and how to use certain tools, which usually inhibits their motivation in creation or composition. If the school can provide composition instruction as a part of music education, students who are passionate about music and want to create their own works but lack fundamental music knowledge will have an opportunity to learn. There are also specific benefits of involving music composition into classroom: “creating an original work and performing it before your peers builds confidence and self-expression; collaborating with

classmates and exchanging abstract ideas builds social and communication skills; and tackling problems to which there are no right or wrong answers builds an open-mind and an aptitude for creative problem-solving, which will stand to each child whatever path they choose in life” (Moran, 2012). Michele Kaschub’s research indicates that compositional praxis involves two principles, stability and instability. Stability emphasizes that human body responses to music simultaneously. Humans naturally capture the patterns from the music and enhance what they usually receive or are used to. For example, “young composers’ first compositions usually draw on familiar music before they begin to extend and change what they know to create something new”. “Composition activities in schools can encourage instability by expanding the definition of what music is within the cultural context familiar to the children. Helping young composers expand their definitions of what music is and can be encourages growth” (2009). Music composition is a complex and nonlinear process that involves critical thinking, experimentation, performances, editing and revising. It is a perfect learning content of constructivism. “The purpose of composition instruction is not to create the next ‘great’ composer, but to allow all children to experience what music has to offer them as human beings. Teaching composition can be an efficient way to accomplish this because it is so all encompassing. It can be included in all types of music classes: general music, performing ensembles, small group lessons, music technology and keyboarding classes” (Kaschub, 2009).

However, schools provide students with limited learning conditions for music class, since both implementing music technology and purchasing musical instruments may cost a lot of money. Technology maintenance and updates are also a big problem for school budget. In fact, music composition is not totally absent from the music education in secondary schools nowadays, especially after the 2014 Music Standards was developed. But other difficulties remain unresolved.

Dr. Lisa did an interview with California high school music educators about teaching music composition. As a result of her interviews, none of the music educators receive training about working compositionally with K-12 students. “Discussion of this question considered that, even though composition courses were taken in college, training to teachers to work compositionally with students may be hesitant due to lack of preparation” (Crawford, 2017).

1.1.2 Problem Statement

The requirement of 2014 Music Standards on “responding to and creating music” has not been met in the music class of US secondary schools, since it is hard for teachers to implement instructions and provide guidance on music composition without appropriate tools and alternative ways to teach music composition. Therefore, students lack artifacts and fundamental knowledge that enable them to develop creativity and personality through music creation as a supplementary activity in US secondary music class.

1.2 Target Audience

Our target audience is US secondary school students who take music class at school. Secondary school general music students are the perfect audience for teaching composition and arranging. “They are creative, inquisitive, and mature enough to make some artistic decisions, familiar with many musical styles, and have the kinesthetic abilities to make subtle musical changes. With some ingenuity on the part of the teacher and the harnessing of middle school students’ natural interests and abilities, wonderful learning experiences are possible.” (Bush, 2007)

The learner characteristics are identified as follows:

A. Physiological characteristics

- a. Age group: 13 - 18 (around grade 7 - 12)
- b. Gender: All gender included

B. Cognitive characteristics

a. Aptitude:

- i. Average physical and intellectual abilities
- ii. Average music intelligence with small proportions of challenged and gifted learners

b. Prior knowledge:

- i. In composition: almost no experience
- ii. In music: some have basic music notation knowledge; some have experiences of playing musical instruments or being a member of the choir; some do not have prior knowledge in music

C. Affective characteristics:

a. Motivation:

- i. Internal motivation: to have fun with music creation; to make their own musical work; to get prepared before pursuing a professional degree in music
- ii. External motivation: to be forced to create music as a part of lesson requirement

b. Attitude:

- i. Self-regulated and patient in learning
- ii. Passionate but hard to maintain interests for a long time
- iii. Uninterested and only willing to finish the in-class task

D. Social characteristics

- a. Ethnical background: diverse racial and ethnical groups

- b. Socio-economic status: varied from good to poor
- c. Relationship to peers: collaborative, competitive
- d. Relationship to teacher: interactive, obedient, detached

1.3 Learning Contexts

The learning of music composition can take place anywhere and anytime if the learner wishes so, but the artifact is designed to be primarily used as a tool in music class at US secondary schools. That is to say, we currently focus on the use of our artifact in compulsory and optional music classes in public and private schools, but there is still a possibility to play with the artifact and create music works at home or anywhere else.

1.3.1 Spatial and Temporal Contexts

To teach music composition with our artifact, there is no need for the class to move to a music classroom (they can if it is the convention). An ordinary classroom with wifi connection would be fine. Each student can use their own mobile devices with a pair of headphones, but a set of loudspeakers are required in the classroom for the teacher's demonstration. There will be several stations set up for students to help each other and collaborate at the novice stage so that moveable desks and chairs are strongly recommended. Students will also listen to the teacher's instruction as a whole class, which may cause some extra changes in classroom settings. The music composition class assisted by our artifact is expected to last for one semester (approximately 14 weeks) with 2 credit hours (1.5 hours) per week, which is the usual time range of a secondary school lesson.

1.3.2 Social Context

The survey by Give-a-Note Foundation (2017) shows that in secondary schools where music education is available, 81% of music teachers are full-time music specialists, a further 15%

of music instructors are part-time specialists, and only 3% of music instructors in secondary schools are not music specialists. In this situation, we can see that most music teachers are qualified, which provides the foundation that the teachers are required to master the usage of the artifact in the first place. Then their role will change from the person who delivers music-related content to someone who guides and facilitates the students to explore music creation by themselves. Teachers will tutor students on how to navigate the tool so that they will not spend extra time on the exploration of interfaces and functions, and will support students through assigning homework and answering questions.

1.3.3 Technical Context

The popularity of mobile phones as an educational tool coincides with the rising popularity of mobile phones among all Americans, including teens. Pew Internet report on mobile phone use among 12-17 year-olds shows that 77% of 12-17 year-olds in the US have a mobile phone (Lenhart, 2012). Based on the wide accessibility of mobile phones and internet connection, our artifact will be published on mobile devices with no cost so that students who have personal mobile devices can use their own device in a most familiar way. Although certain classroom management issues may arise when the teacher asks students to use their own mobile devices in class, the use of mobile phones offers a powerful learning environment and can transform the learning and teaching process so that students can deal with knowledge in an active, self-directed and constructive way (Cheon, Lee, Crooks, & Song, 2012). Besides, a set of headphones for each student is highly recommended in the classroom setting.

Furthermore, projectors have been widely used in the US classroom. Pew Research Center reported that 97% of US secondary school AP and NWP teachers used projectors connected to a desktop computer or a laptop or other digital devices in class (Purcell, Heaps, Buchanan, &

Friedrich, 2013). Therefore, our artifact will also depend on a projector with audio output in the classroom for teachers to enlarge their user interface to make certain introduction and demonstration to the class, as well as for students to share their personal composition documentations.

1.4 Learning Goals and Objectives

1.4.1 Learning Goal

Students will demonstrate music literacy and creativity through composition after a learner-oriented learning experience with our tool. By music literacy, we mean that students will have a basic understanding of theoretical knowledge such as music notations. And by music creativity, we mean that students will apply the learned knowledge to create individualized work.

Most of the time, children's involvement in music activities in schools are of the receptive kind (learning music composed by others). Like in other subject matter domains (e.g., reading and writing texts), Hogenes et al. (2016) assume that in music activities more productive versions of music-making (i.e. composing) may contribute in new and significant ways to children's development. Starting out such learning activities from the children's own musical imagination and giving them the relative freedom to compose their own songs, makes it a form of authentic learning.

1.4.2 Learning Objectives

- A. Students will be able to describe the basic functions of music components in composition.
- B. Students will be able to describe the procedures of composition.
- C. Students will be able to compose a piece of music work individually or jointly with our tool.

D. Students will be able to evaluate the characteristics of different music genres.

E. Students will be able to develop certain interest for future exploration of music.

1.5 Review of Existing Projects

Existing projects about music composition can be categorized into three types: notation-based creation tools, graphics-based music generators, and ensemble synthesizers.

Notation-based creation tools such as Music Note Pad, Symphony Pro and Noteflight are suitable for expert music composers. “These tools convert what [the composer plays] into notated sheet music – including accurate rhythm and key signatures – these programs also offer recording and editing features” (StringOvation Team, 2019). The major functionality of this kind of tools is presented as music notations. The editing and creation of music pieces need to be supported by a composer’s knowledge of music theory, and the composer himself should be highly conscious of the mode, scale, chords, etc. chosen to consist of the music pieces. However, this group of composition tools usually support a multimodal presentation of their functions – users can record a piece of audio and transcribe it into music notations, or compose directly with music scores, or play the embedded instrument simulators, which enable different habits of composing and individualized experiences.

Graphics-based music generators, such as Chrome Music Lab, Singing Fingers and Loopseque Kids, is another kind of music creation tools which is far different from the first category. These generators avoid the use of musical notations and replace them with visual figures and symbols. They do not rely on the composers’ professional knowledge, and can generate randomly organized music patterns. This category is mainly used to engage users at a younger age, mobilizing their vision and auditory together. What is enlightening in this category is the visual

presentation that connects to music symbols as well as the creation process independent from theoretical foundations.

Ensemble synthesizers such as Apple's Garageband are comparatively all-encompassing. They involve a large variety of musical instruments for composers to choose from, presenting them in both forms of chords and scales and of real instrument simulators. This helps composers who play certain musical instruments find similarity with their performing experiences in composition, as well as provides organized sets of music pieces to simplify the composition process. However, the synthesizer does not provide tutorials or instructions so that users may feel confused and overwhelmed by so many functions or cannot make full use of the design.

2 Design

2.1 Content Analysis

A. Learning musical instruments

- a. Listening to the sound of each musical instrument
- b. Reading about the history of each musical instrument
- c. Understanding the structure of the musical instruments
- d. Playing the musical instrument by looking at the actual instrument display
- e. Higher level users: learning music theoretical knowledge through playing the musical instruments

B. Composition

- a. Learning to read and use the MIDI and score notations
- b. Choosing appropriate tempo for designed music
- c. Adapting various music styles to develop personal works
- d. Learning common chord combinations and 24 music keys

- e. Using multiple instruments for one piece to learn orchestration
- f. Creating individual works to address different music genres

C. Band

- a. Creating music with other people to practice synchronization of composition
- b. Communicating music knowledge and terms with band members in order to collaborate with each other
- c. Producing music collaboratively

2.2 Media Selection

We plan to use mobile applications (with Internet connection) as the media of learning music composition, which is promising in improving learners' accessibility to the artifact and not overwhelming them with complicated navigation. According to the four dimensions of media forms (transmission characteristics, recording characteristics, production characteristics and social characteristics) (Collins, Neville, & Bielaczyc, 2000), mobile application has following advantages:

A. Enabling learners to get easy and free access

Mobile devices, together with the Internet connection, increase users' accessibility to content beyond the limit of time and space. In addition to in-class learning, the convenience of mobile devices also enables learners to do assignments or creation in fragmented time periods. And the manipulation of touch screen reduces cognitive load and unnecessary time that learners may spend in getting familiar with a new medium. Furthermore, to publish an application on

mobile devices does not yield material costs so that it can be provided to learners at no cost, and thus enhance students' accessibility and the schools' motivation in official use.

B. Integrating different modes of music representation

Different channels of representing content are embedded into mobile devices. The audio-visual combination serves as the basis of teaching composition. It offers the images of musical instruments, notations and music styles to learners as visual aids, as well as corresponding audio outputs of sound, rhythm, pitch and so forth, to make up for learners' lack of experience in accessing music score paper and different instruments physically, and instead create an immersive environment to interact with. Video is another mode of leveraging learners' fragmented time to deliver knowledge information and conducting preliminary tutorials such as music theory.

In addition, different modes are provided to support learners' composition. Considering learners' various levels in music knowledge and different habits, we create three possible ways to compose: chord splice composition (listening to pre-set chords and aligning them) for novices without any music theoretical knowledge, musical instrument composition (playing directly on a musical instrument) for those who can or would like to play instruments, and score notation composition (writing notes down or recording voices to transcribe) for proficient musicians to make/revise documentation by themselves.

C. Enabling recording, modification and production easily

Mobile technologies provide relatively large internal storage for composition records within the application, which can facilitate easier modification of stored music files and even keep

modified records when the application is connected to the Internet. Production and distribution in different formats are supported within the mobile platform with its integrated digital functions.

D. Enabling collaborative learning and peer feedback

As social media are prospering with the development of mobile technologies, it is more likely to build up a social network across different mobile applications. Therefore, the connection of users in an application can be leveraged to prompt collaborative learning. They can review others' projects as a reference or inspiration for their own, and learn from expert composers. Besides, due to the capability of online synchronicity, learners can work together on the same project (i.e. composing as a band) and offer feedback to others' works, changing from a single-way instruction mode to a bi-direction peer learning mode.

2.3 Theoretical Frameworks

2.3.1 Constructivism

Learners will utilize the app based on constructivism. Constructivist learning theory shows that an individual uses his own understanding of and experiences in the world to support learning (Olusegun, 2015). Composition is a typical learner-oriented event that creates personalized meaning and is conducted in varied ways. Composers set personal goals that they expect to achieve, such as making original music works or understanding the procedures of composing, and choose to compose in different music styles according to their unique preferences as well as prior experiences and knowledge. Therefore, we provide three composition modes for them to choose from, within which a large variety of music chords and beats are offered to personalize their composing works.

2.3.2 Motivation

Motivation is a person's desire to pursue a goal or perform a task, which is manifested by choice of goals and effort in pursuing the goal (Driscoll, 2018). Composition, to most of the students, are not compulsory. Therefore, to leverage their positive and negative desires could be useful during the design. For those who are interested in learning music composition, the app provides novice tutorials from scratch and a basic know-how brochure so that the novice composers will generate self-efficacy in the learning process. That is to say, learners will feel that they can succeed in mastering the task and may attribute their mastery of preliminary composition skills to their step-by-step hands-on practice, which promotes their learning motivation (Driscoll, 2018).

Furthermore, to target those who have less interest our application will use a game-like mechanic that collects emblems and unlocks different functions while the students complete more composition tutorials. This mechanic tries to prompt those who use the application for external factors (e.g. to complete in-class requirement or home assignment) to develop internal motivation from curiosity, and hopefully generate volition in learning composition.

2.3.3 Project-Based Learning

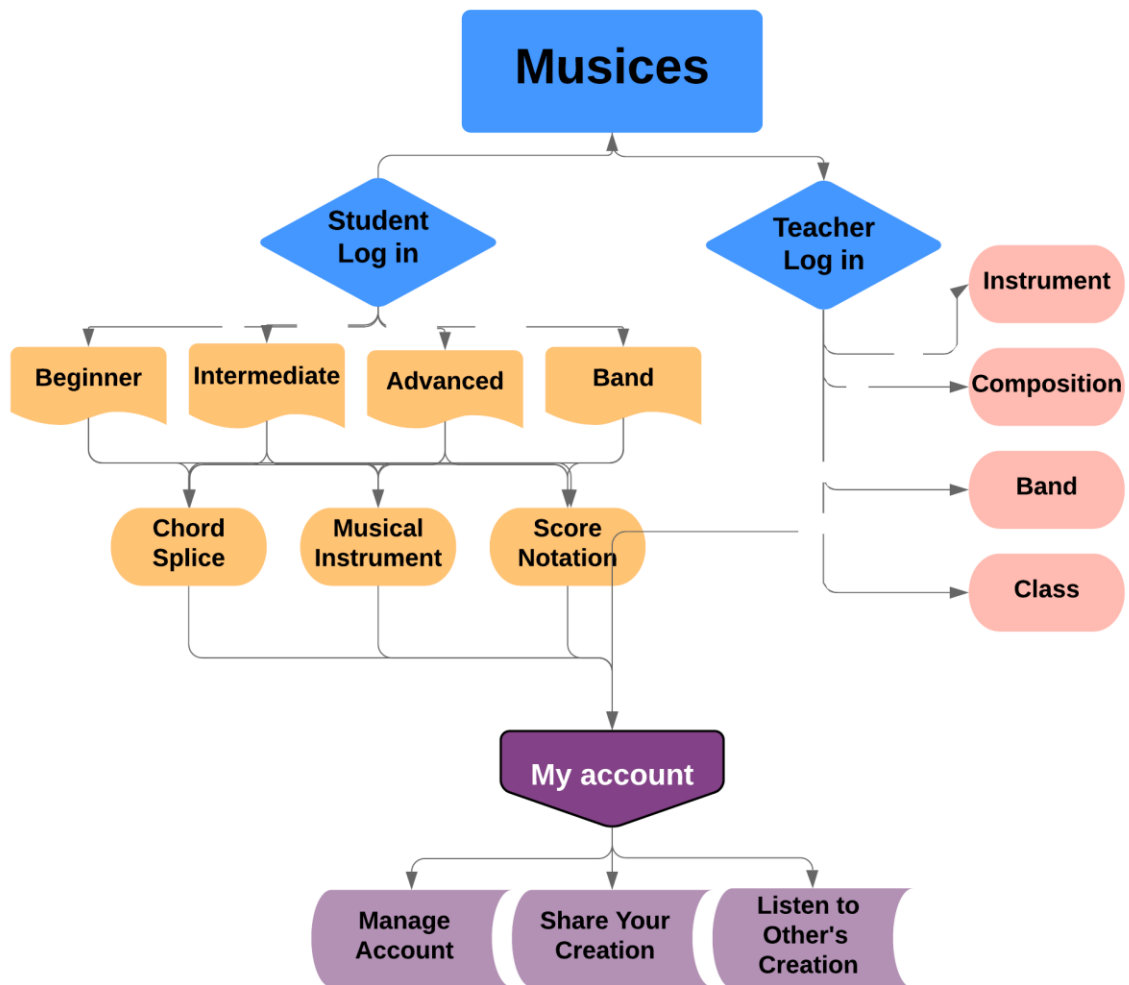
Project-based learning leads to artifact production in the process of solving a problem, and relies on digital tools to support planning, data collection and analysis, modeling, and information-gathering (Hmelo-Silver, 2004). The works of composition are mainly the projects students will produce, the difficulty and scale of which are usually chosen by the instructors or the learners themselves. Learners utilize the application as a tool and platform to create, record and share their projects, or collaborate in one project. The instructors can also assign projects as homework in the application and view the progress of each student's projects.

2.3.4 Compositional Thoughts Paradigms

Laske (1989) identified two paradigms of compositional thoughts: rule-based paradigm and model-based paradigm. Rule-based paradigm refers to the creation of music originally from the rules of harmony according to music theory, such as the rule that consecutive chords usually share common tones (Anders & Miranda, 2010). Model-based paradigm refers to the packaged music patterns to be used, which relies on estimated pre-set melodies, tempo and pitch patterns. The model-based composition paradigm certainly follows music theory and rules, but emphasizes more of the organization of the automatically generated pre-set music elements (Roig, Tardón, Barbancho, I., & Barbancho, A.M., 2014). Rule-based paradigm usually uses score notes or a musical instrument for composition, which is suitable for composers with music experience and knowledge. And model-based paradigm provides an easier composition option for novice composers, as well as a useful computational pattern for expert composers to arrange and orchestrate. We deliberately designed the chord splice composition for novice composers based on model-based paradigm, which provides them with packaged chords and modes to simplify the composition process before they develop the abilities to create music works purely from music rules.

3 Prototype

3.1 Flow Chart



3.2 User Interface Design and Overall Functionality

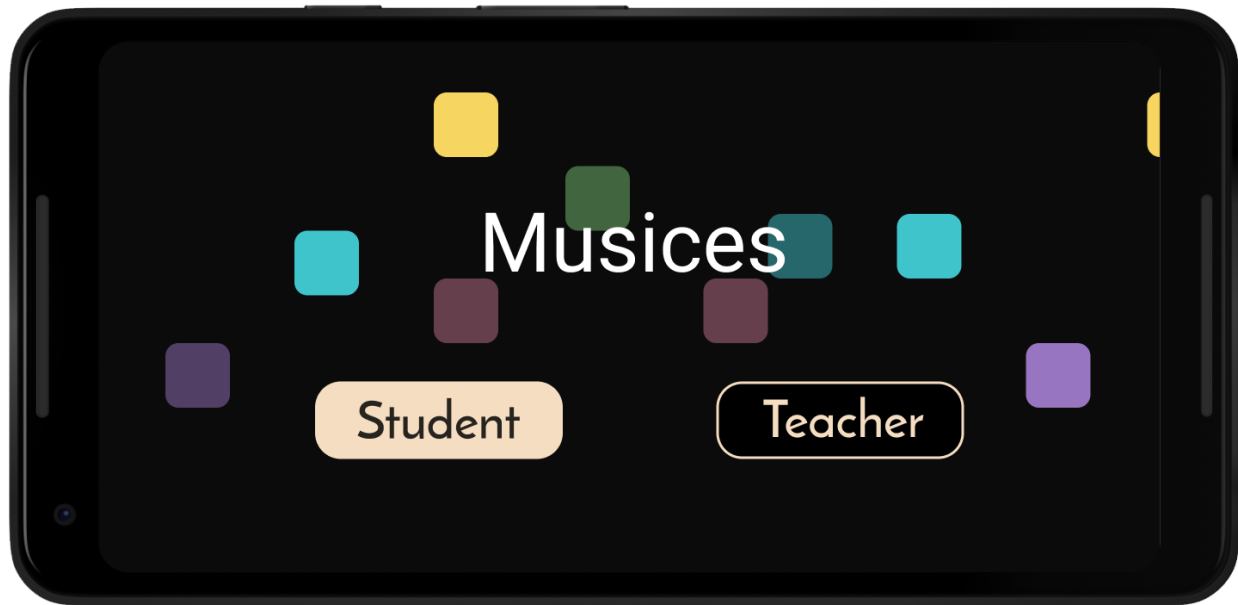


Figure 3.2.1 Homepage

The name of our application is “Musices”, the Latin translation of “musical”. We aim to use the adjective to express a sense of active engagement in music, and show the wide possibilities of music from the perspective of time and style with a Latin word since the language is one of the origins of the English language. Besides, there are two versions for our application: the teacher version and the student version.

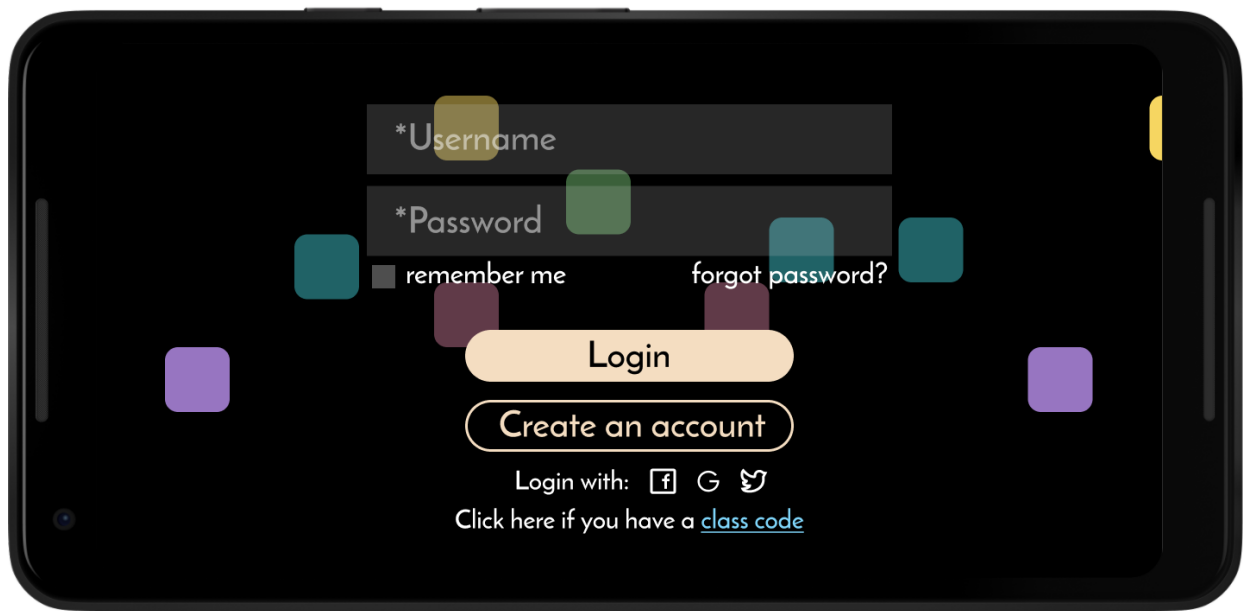


Figure 3.2.2 Log-in Page

For the log-in page, both students and teachers can create their own account or log in with their social media accounts. And for in-class use, students will be given a class code created by the teacher, and can log in with that code as a member of the class.

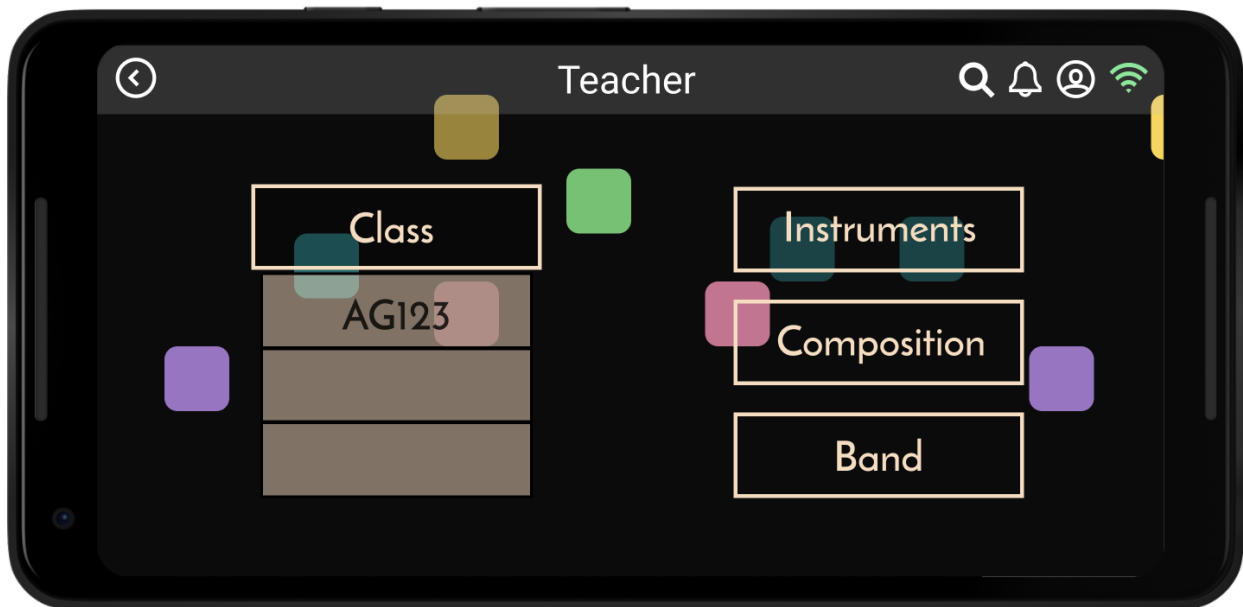


Figure 3.2.3 Teacher Menu Page

Teacher's portal has instruments, composition, band, and class components, which serve teachers for both teaching and composing purposes. The class function is for teachers to create and organize classes they are teaching in order to upload assignments, evaluate students' work, and supervise their progress.

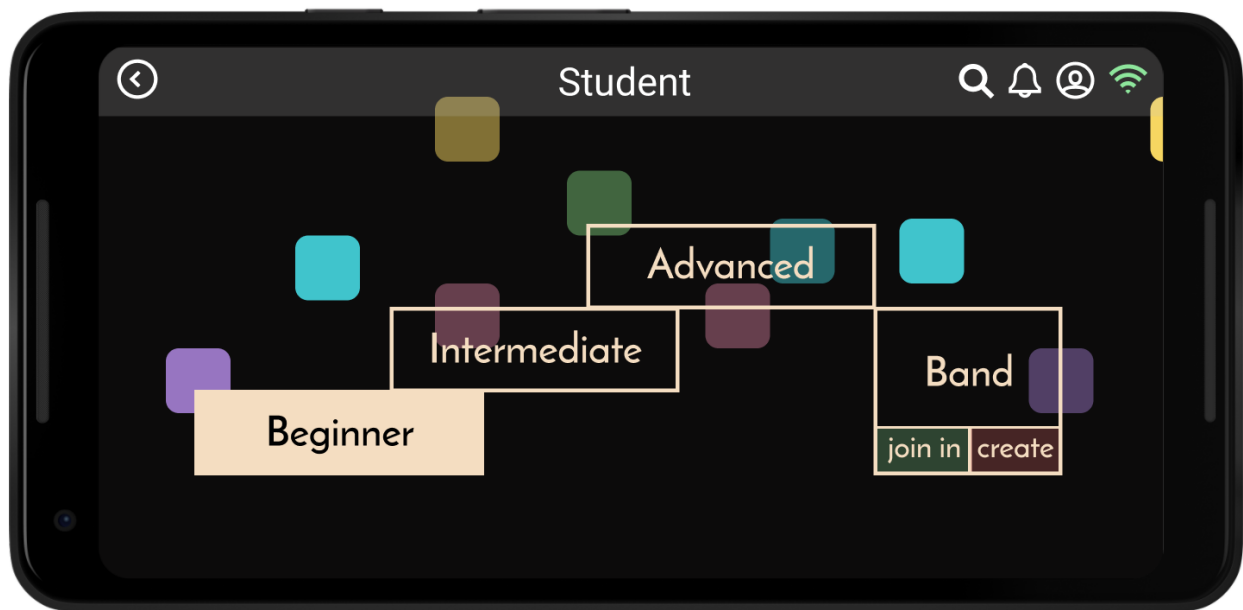


Figure 3.2.4 Student Menu Page

After login, student users will go to the menu page with three selectable levels: beginner, intermediate and advanced. After tapping each level, there are descriptions of expected current user knowledge and capabilities, which help students to place themselves into an appropriate level. And the band feature is also provided as an interactive function of group learning.

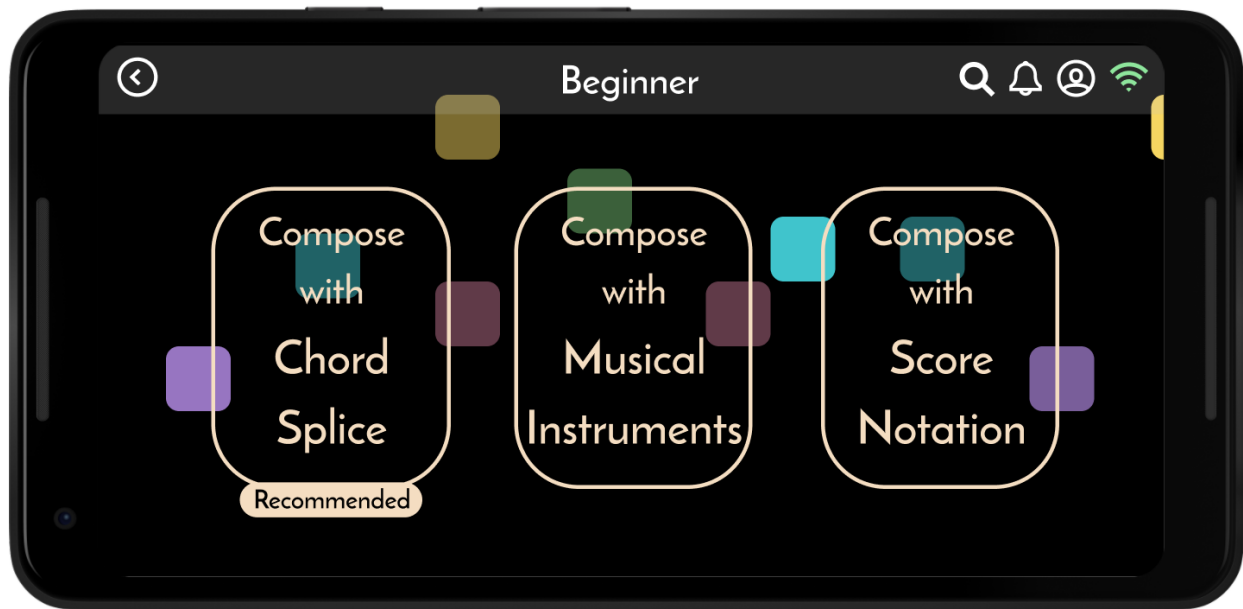


Figure 3.2.5 Student Beginner Level Page

Users are able to compose music through three types of tools: chord splice, musical instruments, and score notation. We will elaborate on the first two functions in the following article, and for the score notation composition function, it is more suitable for proficient musicians and composers. They can write down score notes directly in that section or record their voices to make transcription.



Figure 3.2.6 Musical Instrument Composition Page – Instrument Selection



Figure 3.2.7 Musical Instruments Page – Piano

Musical instrument composition contains a selection of different musical instruments in categorized groups. There is a search engine for users to search for a particular instrument. In each instrument interface the instrument's real appearance with

tutorials and different information sections is displayed. Users who have prior experience in playing certain musical instruments can directly use the visualized instruments to produce melodies, which will be transcribed as score/midi notations and saved as both documentation and audio. The midi notation, which only contains block representations as symbols of the rhythm, is designed for those who do not have enough music knowledge to read music notations. Users are also able to use this function as a tone pool to search for the instrument sounds they want to use in composition.

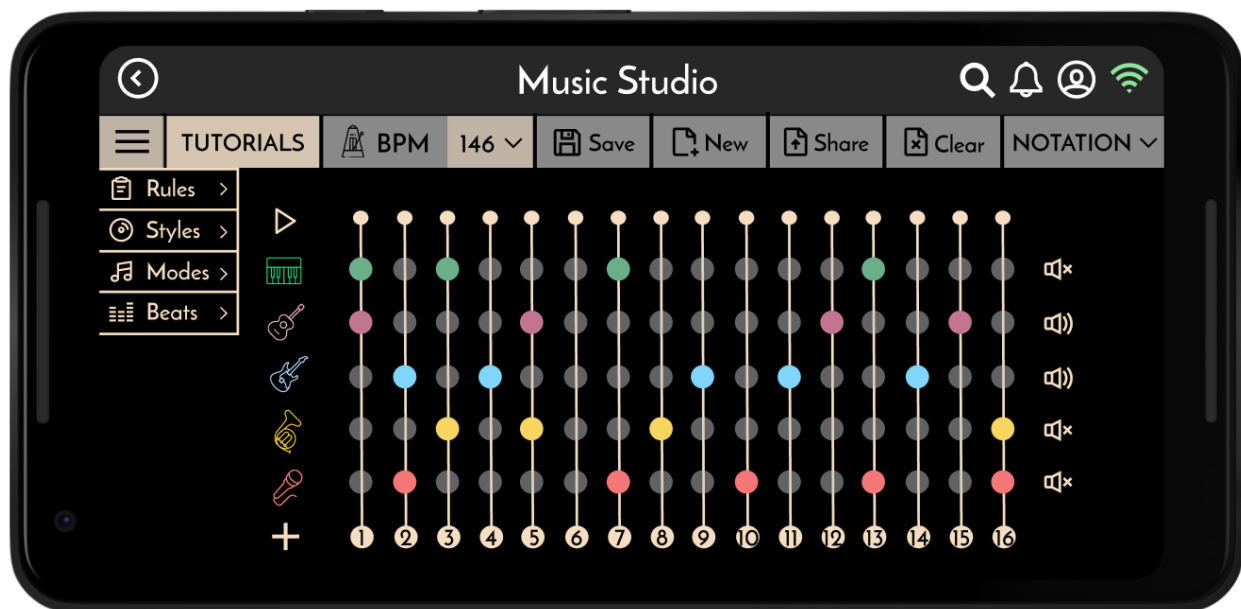


Figure 3.2.8 Chord Splice Composition Page

It is the most important and novice-friendly function in our design. In this interface, users leverage a MIDI pad template that simplifies chords, keys and beats to compose and arrange by tapping spots. The spots in different colors represent different musical instrument sounds, and each of them contains a loop of melody or a drumbeat. Users can choose how many musical instruments they would like to integrate into a music piece by tapping the “plus” icon. They can look through the instrument function first if they are not

familiar with the sounds of different instruments. To save and share the template and demo are feasible. There are also score and midi notations automatically generated for the users to browse through, but this requires very solid music theory knowledge.

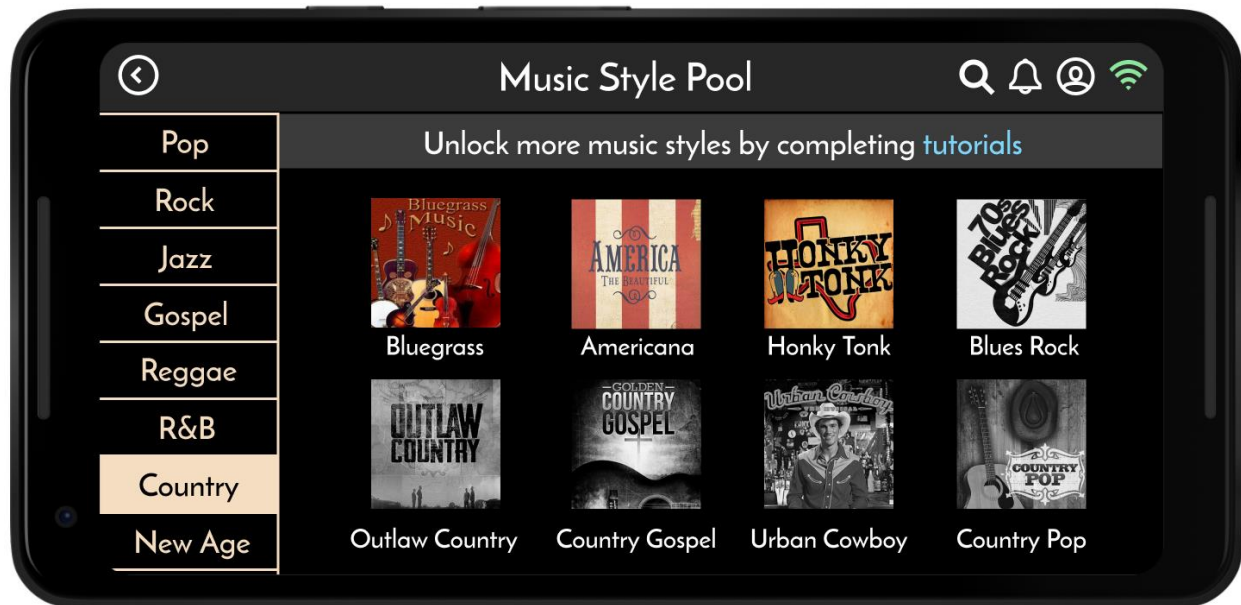


Figure 3.2.9 Music Style Pool

The application provides pools of music styles, beats, modes, etc. to assist the learners' composition based on their music preferences. The music style pool helps users create their music by setting up the featured melody of a particular music genre, which is supported by the model-based composition paradigm. For instance, if the user selects R&B music, the tone and drum beats will have the features of that specific music atmosphere. To unlock more music styles, learners have to complete tutorials to get motivated and rewarded.

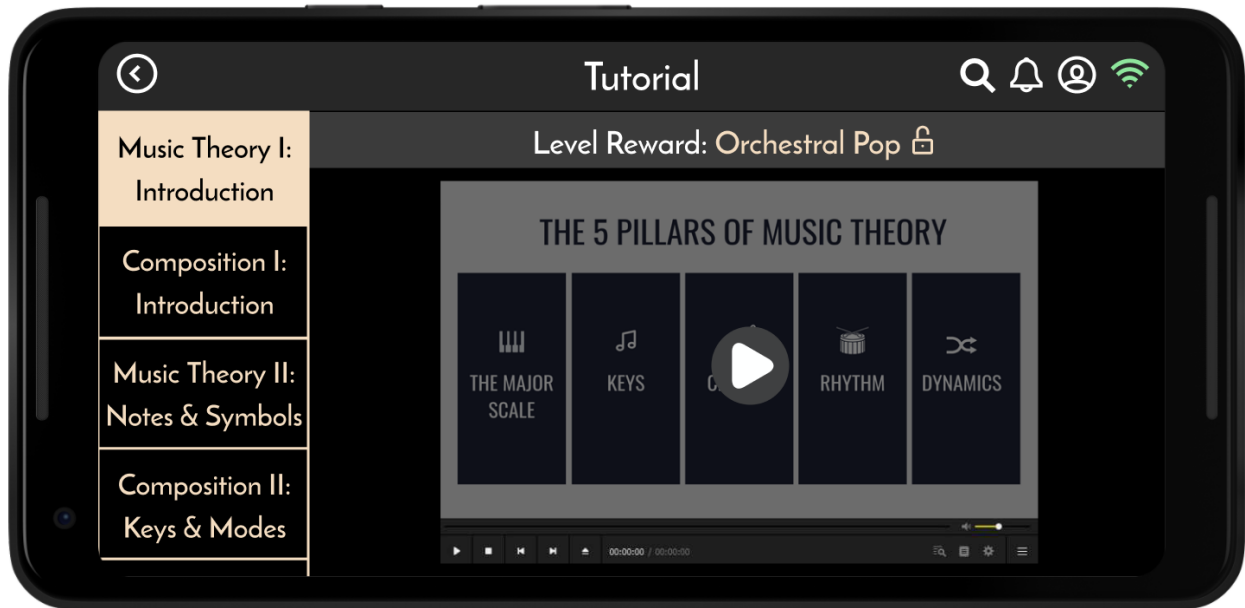


Figure 3.2.10 Tutorial Page

The tutorials combine music theory and composition instructions to enable learners to practice the theoretical knowledge they have learned in composition. The tutorials are basically presented through short video instructions with multiple-choice tests in between.

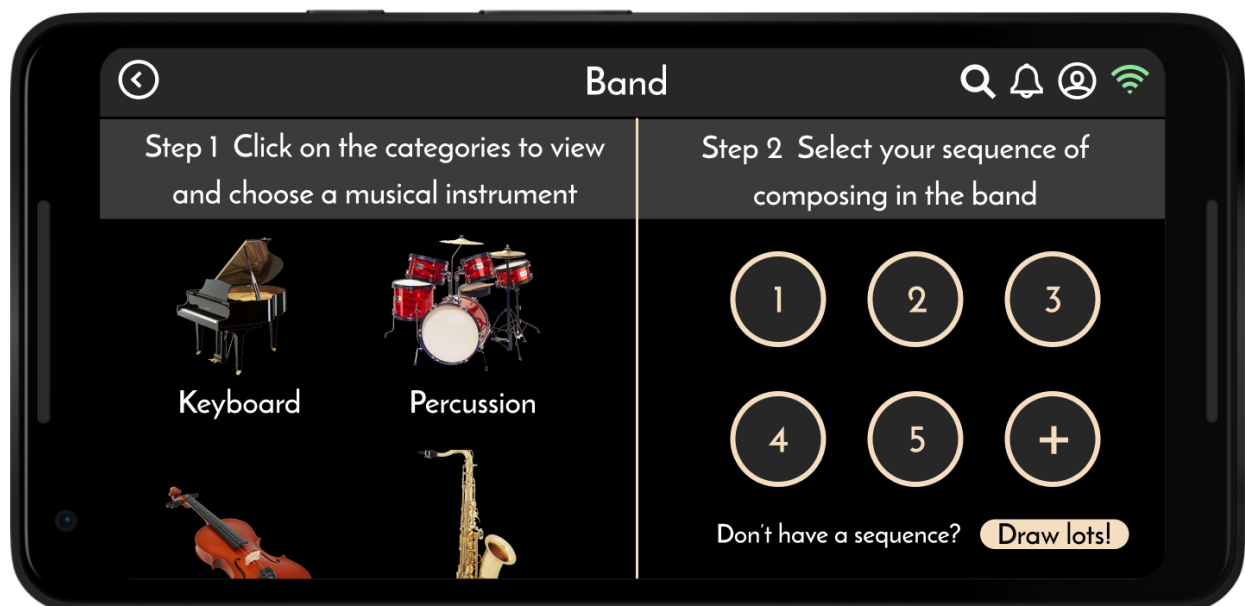


Figure 3.2.11 Band Page

Tapping the band icon in the menu page, users can create their own composition band or join in others' bands. First, users need to choose a musical instrument that they will use to create music with. Then all the band members can manually choose or draw lots to decide the sequence in which they will compose. The next person will always need to review the previous creation and compose based on that to keep consistent in the key of their work.

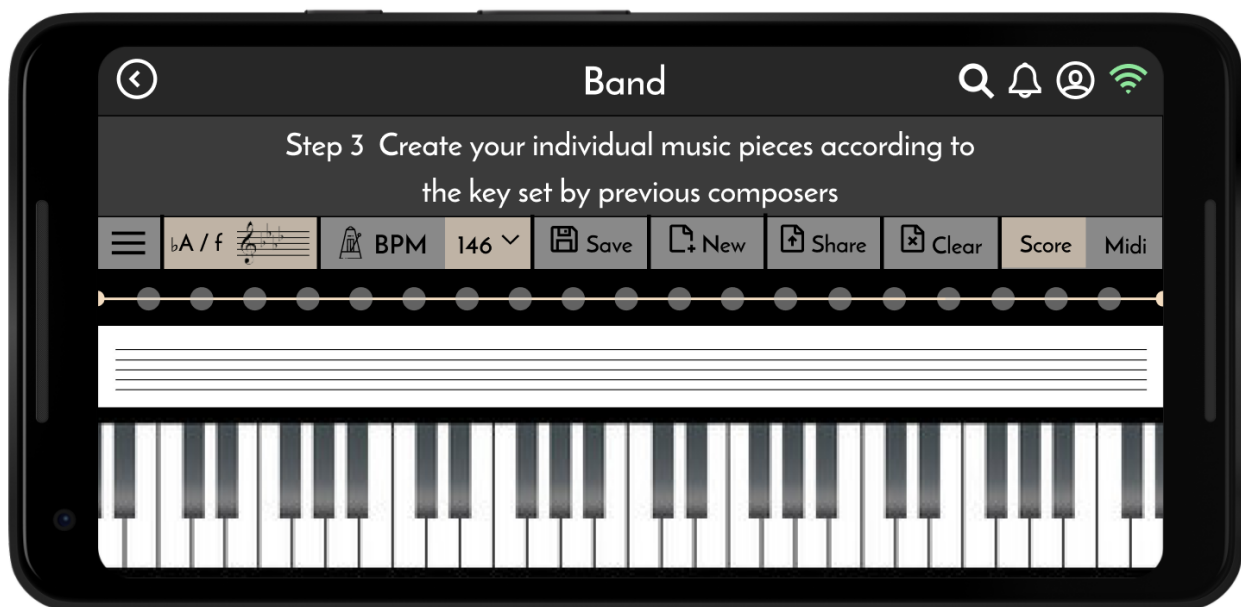


Figure 3.2.12 Individual Composition Page within the Band Function

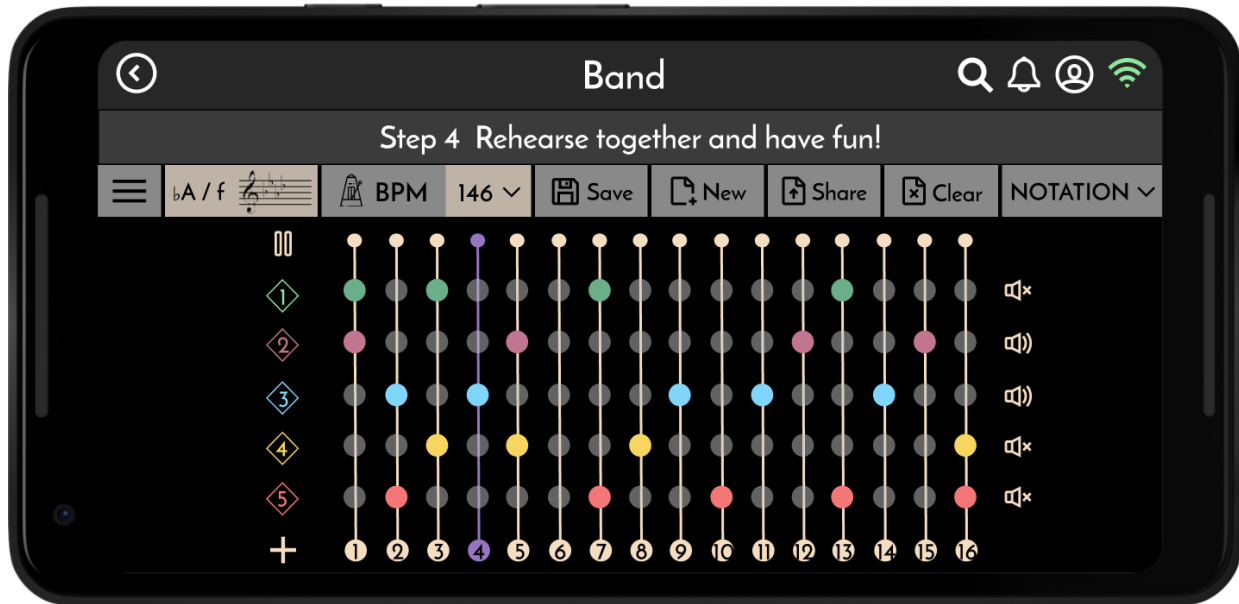


Figure 3.2.13 Chord Splice Band Collaboration Page

After having a sequence of composing, users will enter the individual creation page. Three modes of chord splice composition, score notation composition and musical instrument composition are available at the same time. And finally, there will be a collaborative view of different instrument tracks created by each band member. Previous creation of other members will be visible and audible in this page. It can be an editing and “rehearsing” platform for the entire band.

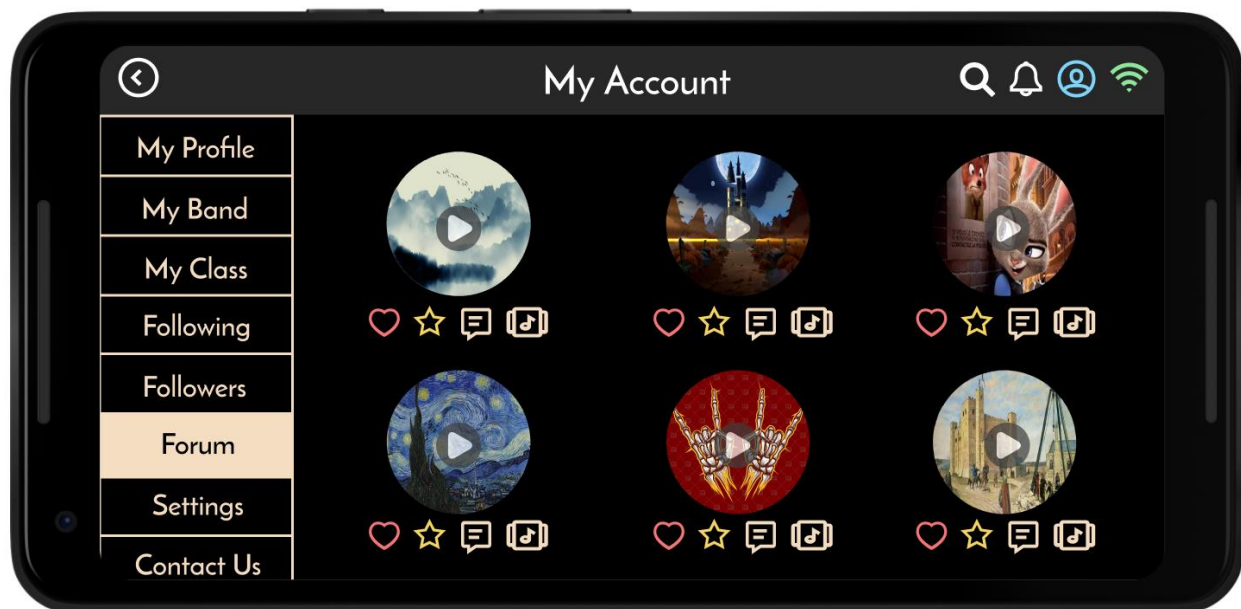


Figure 3.2.14 Personal Account Page

Users can manage their accounts by tapping the “profile” icon on the top-right corner of the toolbar. An overview of profile, band, class information, etc. is available here. For instance, the forum is a place for users to share their work and inspire their music journey. They can listen to others’ music creation and provide feedback, as well as post their own works in this forum or other social media platforms. The four icons below the playable files are “Favorite”, “Collect”, “Comment” and “View the music documentations”.

4 Implementation

4.1 Implementation on Teachers

We plan to use a top-down implementation plan, which relies on the administrators’ decisions about how to integrate the technology innovation into traditional instruction (Driscoll, 2018). Our application will be introduced to the US educational system first, since the latest Music Standards have not been met in secondary school music classes, after which the administrators can encourage music teachers to adopt this tool and use it in their classroom.

Considering that teachers may feel alien to a new tool at first, we will provide training for teachers both in the application and offline on campus to enhance their technological knowledge and skills to navigate the application. As a result, teachers can hopefully get support to overcome their attitude and skill barriers and make a faster adoption.

Besides, due to the availability of resources as one of the conditions to facilitate implementation (Smith & Ragan, 2004), we will also demonstrate the flexible functionalities and abundant resources of our application to teachers so that they will know that they are able to customize their in-class content with the assistance of our app. For instance, they can use either all the functions and create a flipped classroom or part of them to supplement their instructions in class.

4.2 Implementation in Class Environment

The implementation of our application in music class requires certain technical contextual support. The school should have classrooms which are audio-supported, projector-equipped and connected to the internet. Moveable desks and chairs are suggested so that students could be aligned in groups to help each other and conduct collaborative composition. The teachers' and students' personal mobile devices are required for the music class, with optional sets of headphones to minimize disturbance. The school should also provide two to three public tablet devices for each music teacher in case there is a special need from the students.

5 Evaluation

5.1 Evaluation Plan for the Learning Environment

To evaluate the learning environment of our application includes the evaluation of usability, learning efficiency and implementation. All the users have their own accounts, whose usage data can be monitored by the application's back-end console. Teachers are the primary users to be monitored because they are the decision makers on whether the class will adopt the application and on how frequent students will use it. Therefore, we will retrieve the back-end data to see the ratio of teachers' in-class use of our application and students' learning frequency and duration. In addition, we also have a forum where users can share and comment on others' creations. The level of user activity, as well as the degree of interaction between peers, can both help us evaluate whether our learning environment is effective and developable. Through monitoring the degree of activeness of teacher users and student users in different functions, we can identify what part is more popular and effective for future iteration.

5.2 Evaluation of the Learners

The application is a convenient teaching tool for teachers, and it also provides students with a portable learning environment. The evaluation of the learners is basically teacher-oriented and application-assisted, and will focus on the degree to which the learning goals and objectives are achieved. Teachers can create classes in their accounts to organize different classes so that students can be evaluated and observed through online class organization and their in-class performance. The teachers can use their own rubrics to evaluate students according to the learning content and goals. For example, teachers can take the initiative to divide students into groups for collaborative composing projects, and monitor the progress of each individual in the application or give a quiz online. Teachers can also ask students to upload their creations as part of the assignments, and give comments and feedback during evaluation. Students can also evaluate their own learning effectiveness by

completing the tests embedded into the tutorial videos. The application is an open resource for both teachers and students. It is not designed to be a self-learning tool in which teachers have to follow the instructional content to teach. Instead, they can use it as a combination of technical music simulations that are portable and easily accessible and customize the music class based on their own teaching philosophy. Teachers are given the freedom to decide their own rubrics to evaluate students' learning.

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