A537: Music Without the Octave: Wendy Carlos's Unique "Scales" Lesson Plan

Materials

- For teacher
  - *Beauty in the Beast* by Wendy Carlos CD
  - Keyboard
  - Whiteboard
  - Audiotool 'alpha scale' project
  - SplashA537-Reference Google Sheet
  - Student responses for pre-test
- For students
  - Any way to take notes (will be important when looking at theory and composing)
  - SplashA537-Reference Google Sheet
  - Audiotool 'alpha scale [name]' project created by teacher
  - (To be completed ahead of time) questionnaire

Objectives

- Understand how these scales were found
- Be able to discuss potential issues and solutions to theory involving Alpha
- Time to experiment in composing in the scale, both melodies and harmonies
- Developing ways of analysing and discussing compositions in Alpha

Overview

1. Introductions
2. Historical background
3. Introduction to scales and how they are created
4. A closer look at Alpha (includes theoretical questions)
5. Experimenting in composing
6. Wrap-up

Plan

I. Introductions of teacher and students
   A. Before coming to class students will have:
      1. Read through the SplashA537-StudentPreparationInformation document
         a. https://docs.google.com/document/d/1J8qmvOVPCSDk_SnB_rMcE0aN1XcW-NKUobsNm_AwR3k/edit?usp=sharing
      2. Created an account on Audiotool
      3. Completed the questionnaire by 5PM on 11/13
         a. https://forms.gle/QEfkybN3SS6asPgS9
      4. Gotten required materials in place to begin class
   B. Before coming to class teacher will have:
      1. Gone through the questionnaire and made notes on what additional material will need to be covered

2. Record what students know and other basic information to have readily available during class
3. Created audiotool projects for each student and shared it, along with the alpha scale project, with them
4. Have class set up to include computer with zoom, keyboard, whiteboard, and student information

C. As class is beginning and students are coming in, play 'Beauty in the Beast' track from CD

D. Introductions

1. Teacher then students
    a. Name, pronouns, a boring fact about yourself, instruments, anything else

II. Historical background for context

A. Brief walk through history of WEAM

1. Developments in tuning
    a. Just vs equal temperament
    b. The Well-Tempered Clavier
2. Chasing dissonance throughout time
    a. As get used to sounds of 'dissonant' harmonies, need more dissonance to shock
    b. Views on dissonance vs consonance have changed over time

B. Brief biography of Wendy Carlos

1. Trans (watch out for deadname), transitioned in 70's, came out in 1979
2. Major works
    a. *Beauty in the Beast*
        i. Album that contains Alpha and Beta
        ii. Also has Harmonic scale (found in some non-western music) super-just scale 144 notes/octave
    b. *Switched-On Bach*
        i. Most well-known today
        ii. Bach pieces performed on a moog synthesizer (brand of modular synthesizer, which are build-your-own synthesizers comprised of various modules)
3. Synthesizer musician and composer
    a. Also a physicist! (Why able to find these scales so well)

III. Introduction to 3 scales and how they are created

A. Introduce the names and tunings for each

1. Alpha: 78c
    a. Split m3
    b. Very different from western music
2. Beta: 63.8c
    a. Split P4 (like symmetric 19 division)
    b. Closer than alpha to western music
3. Gamma: 35.1c

        a. Very small (like more microtonal scales)
    B. Physics behind tunings
        1. Hertz and cents definitions
            a. Hertz: frequency, number of cycles per second
            b. Cents: 1/100 of the interval of a half step in standard western music
                i. Think about tuning triads and adjustments have to make
        2. Relationship
            a. Formulas:
                i. If *a* and *b* are notes and *n* is the interval between the two notes in cents
                ii. b=a*2^(n/1200)
                iii. $n=1200*\log_2(b/a)$
            b. Why these formulas?
                i. A3=220Hz, A4=440Hz, A5=880Hz
                ii. Number hertz between notes increases as hertz increases (why an exponential function)
                iii. Because relationships between octaves are 2:1 (multiplicative, not additive)
                iv. If base interval between notes by hertz, will get smaller and smaller intervals
            c. Use in context
                i. If know the measurement in hertz of a note and the distance between it and another note in cents, can find the measurement of the second note
                ii. See SplashA537-Reference Sheet 'Notes equivalents' formulas used in spreadsheet
        3. In the context of Alpha/Beta/Gamma
            a. Means there are 78 cents between two notes in the scale
                i. Smaller than our system
            b. Ms. Carlos found these scales through experimentation, focusing on m3, M3, and P5 and ignoring the octave

IV. A closer look at Alpha
    A. Redefine it with cents (78) and intervals
        1. 4 steps to m3 (vs 3 in western)
        2. 5 steps to M3 (vs 4)
        3. 9 steps to P5 (vs 7)
        4. 16/17 steps to around the 8ve (vs 12)
    B. Listening
        1. Listen to 'Beauty in the Beast' track (from CD) which has both Alpha and Beta going back and forth
            a. Briefly discuss reactions
        2. Listen to 'alpha scale' (from Audiotool) for scales and harmonies in Alpha

        a. SplashA537-Reference ‘Audiotool ms ref’ Sheet contains measure numbers and what they contain

C. How might theory work in this system? (open-ended questions to get students thinking about possibilities)
    1. Let students know that after this will be composing, so should take notes on their (initial) answers to help them make decisions
    2. Must the intervals be labeled the same way?
        a. If so, would need writing system that provides that (possible?)
            i. Ms. Carlos in practice has tuned 1 ‘8ve’ to 2 physical 8ves and notated with standard notation
        b. How do the labels m, M, °, +, and P in regards to intervals work?
            i. P4+P5=P8
            ii. M3+m6=P8
            iii. +2+°7=P8
            iv. P1+P8=P8
        c. But we don’t have all the standard intervals!
            i. Have a M9 (P5+P5) but no M2
            ii. Interestingly, do have a TT
            iii. Have roughly any interval that is some combination of m3, M3, and P5
    3. What note names might we use?
        a. Ms. Carlos used standard notation, 1 ‘8ve’ = 2 physical 8ves
        b. I have labeled with Greek letters, repeating on the P5
            i. 8ve is fundamental in western music, what interval would be fundamental in Alpha?
            ii. I vote for P5 because important in western as well and fits well
        c. Do we need flats and sharps?
            i. Importance of having them in western system: allow to have scales some version using 1 of each letter
            ii. What would we need to standardize/decide on for Alpha to make the decision about flats and sharps?
    4. What would a scale be in Alpha?
        a. Does it depend on how we decide to label our pitches?
        b. What pattern of steps (mainly whole and half) would we want?
        c. Major vs minor? (have m3 and M3)
        d. Would sevenths really be sevenths? (depends on where repeat)
            i. Would we have a leading tone?
    5. Harmonic progressions and tonic vs dominant vs sub dominant
        a. Traditional harmonic sequence
            i. How we determine what kind each chord is
            ii. Do we care about traditional harmonic sequence?
        b. What might be imperative to establish in a harmony?
            i. Tonic? What counts as tonic?

            ii. Do we need typical chords for a resolution?
            iii. How do we give a sense of closure?
            iv. How do we make the listener feel unbalanced?
        6. Do the students have any other questions/thoughts that should be considered that haven't been brought up yet?

V. Experimenting in composing
    A. Consider questions from IV. to guide
        1. Begin by allowing students a few minutes to mess around and listen, exploring the sounds
        2. Students should be able to explain how they are defining a chord and what notes they are choosing to use
        3. Allow students to start composing based on their own answers
    B. Composing a melody
        1. 4-8 bars only
        2. Students will have 5-10 min to work independently composing
        3. Share melodies with the class
            a. Student in question discusses what decisions they made to provide them with a framework (if any)
                i. What were they trying to portray with melody (mood)
            b. Other students provide reactions, including what they thought worked and what didn't
                i. Keep in mind all subjective
        4. General reflection on what worked and what didn't
            a. Any general consensus on questions from IV.?
            b. What might students change to alter melody?
    C. Composing a harmony
        1. May be alongside or independent of melody
        2. 4-8 bars
        3. Students will have ideally at least 10 min to work independently
        4. Share harmonies with the class
            a. Student in question discusses what their goals for harmonic sequence was and how they worked towards them
            b. Other students provide reactions, did they hear what the student was working towards?
                i. How did the student's goals impact their reaction to the harmony?
        5. General reflection on what worked and what didn't
            a. Any general consensus on questions from IV.?
                i. Do we need a I chord?
            b. What might students change to alter harmony?

VI. Wrap-up
    A. Ask students their reactions to Alpha
        1. Do they think it is a viable scale to work in?

2. How does having grown up listening to western music affect our understanding of and relationship with Alpha?
3. Is it something they wish to continue exploring?
4. Do we need the octave?

B. Thank students for participating in the class