

From beat to bit - Working with secondary-school students in the Sparkling Science project "Engineer Your Sound!"

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Abstract:

The program "Sparkling Science", funded by the Austrian Federal Ministry of Science and Research, facilitates the cooperation of the scientific community and schools. "Engineer Your Sound!" (EYS; 2008-2009, developed by Anita Thaler and Isabel Zorn) is one of the current projects in this program. Students of a secondary school, specialized in music, work together with teachers and researchers on the creation of music-technology products which serve as a basis for a didactic concept that could help peers who have no practical musical competencies in becoming musically creative. Thus music is tested as a vehicle for an interdisciplinary and participatory approach to designing technology with young people. In our presentation at the IAS-STs conference we contributed to the session "Participatory technology design: SET and youth" introducing intermediate results of this project and report about our experience in working with the students.

Engineer your Sound! (EYS) is a project developed by Anita Thaler and Isabel Zorn, both researchers focusing on SET (Science, Engineering and Technology), education, and gender. It is funded by an Austrian governmental program called "Sparkling Science" which facilitates the cooperation of research and school. Thus young people get to know how research works and researchers get new impulses for their studies.

After shortly describing the cooperating partners we will present the objectives and how the project was implemented. Furthermore we will report about some observations we made while working with our students and how we reacted to some of these observations. Finally we will give a short outlook on the next steps of EYS.

Cooperation

The project is a cooperation between 28 students and two teachers (Ulrike Weitlaner teaching music, and Hermann Grießer teaching physics and sports) of the Gymnasium Dreihackengasse in Graz and researchers from the IEM – Institute of Electronic Music and Acoustics (Gerhard Eckel, the head of the institute and Birgit Gasteiger, master student of electrical and sound engineering at the University of Art and University of Technology in Graz) and Isabel Zorn, an expert in gender and media didactics, currently working at the University of Koblenz-Landau. The project leading institution was the IFZ – Inter-University Research Center for Technology, Work and Culture – with Anita Thaler (project leader), Christine Wächter and Birgit Hofstätter.

Objectives

Starting point of the project is the impression that many young people seem to lack interest in technology even though they use it in everyday life (e.g. computer, mobile phone, MP3-player). Consequently the objectives are to raise students' interests in technology and engineering through a participatory approach, since we assume that by experimenting with and consciously using technical devices, people become more confident and automatically interested in what is working behind the devices. However the scientific objective of the project is the development and testing of interdisciplinary, innovative teaching and learning settings in cooperation with the students (Thaler & Zorn 2009). We assume that instruction in natural science and engineering subjects in school has to be made more attractive by choosing topics close to everyday life of young people, in order to encourage them to consider these subjects in their choice of profession. We especially consider the integration of new media technology in contemporary teaching and learning very important.

Implementation and first steps

The project is organized in four parts: Firstly, we introduced the field of music technology to the students. Secondly, they realized their own project ideas together in

working groups. Thirdly, together with the pedagogues the students develop didactic concepts for music and technology teaching. Fourthly, the students present the outcomes of the project.

For the first part, the field of music technology was introduced by excursions to the IEM and to the University of Technology. Thus, an insight into currently used technologies in the field of music making and music production was given.

The first excursion was in October 2008 to the "Cube" of the IEM. The Cube is a small concert room with a 3D sound reproduction setup and a motion capture system. The motion capture system consists of infrared cameras which detect infrared reflecting material, attachable on any part of the body or other objects, like the so called 'handhelds'. The motion data of the reflecting material can be connected to a sound generation process which is further controlled by making gestures.

The second excursion was a visit to the recording studio at the University of Technology in Graz in February 2009. There the students got an introduction into the recording and post production processes and necessary equipment. On this occasion, the students had the possibility to make short recordings on their own.

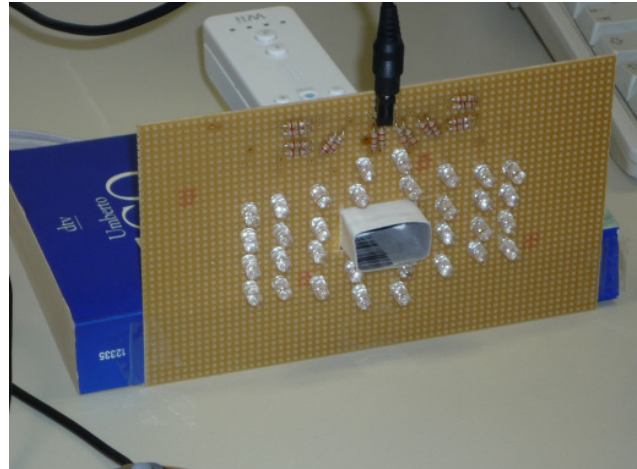
The projects

At the kick-off workshop the second phase was launched and four groups of students started off to realize their ideas. These groups named themselves "Emotions", "Soundexperience", "Hintergrund im Vordergrund" meaning "Background to the Foreground" and "Just Danube". In a follow-up meeting a fifth group was formed by students who call themselves "Die Spitzel" meaning "The Spies".

The members of the group "Emotions" wanted to find out how film music influences the audience's emotions and interpretations of scenes. For this experiment the students produced three short films and recorded six songs in a recording studio. Each film now has two versions differing in their background music – one version is supposed to evoke

sadness and a pessimistic interpretation of the film whereas the other version should induce happiness and an optimistic attitude.

“Just Danube” is a group of three young women who wanted to create an ‘air-instrument’. Together with Birgit Gasteiger they designed a system consisting of an infrared emitter (a circuit board with infrared emitting diodes), infrared reflecting material, and an infrared camera (integrated in the “Nintendo Wii”-remote control) accessing a computer via bluetooth connection. The emitter sends out infrared light to the reflective material attached to the fingers of the performer. The reflection allows the infrared camera placed in the center of the circuit board (see illustration) to detect the position of the fingers. The camera signal is received by the graphical programming language “PureData” and the position data of the reflective material is associated to a certain note. So, depending on the position of the reflective material different tones are triggered.



Sensor unit of the 'Air Instrument' (Photo taken by Anita Thaler)

The group members of “Soundexperience” wanted to experiment with sound effects. For the basic material they composed and recorded a medley of different music styles. The processed audio tracks were first mixed down to a ‘normal’ version. In a second editing session the tracks were experimented on and transformed with various sound effects by the program “Adobe Audition”.

“Hintergrund im Vordergrund” means “Background to the Foreground” which is the name of the fourth group. These students wanted to bring background noises to the foreground. First they filmed random scenes at public places. From this material three scenes were chosen to be processed. In order to emphasize background noises the students searched Internet databases for sound files containing similar or even stronger

noises which were added to the films. So, for example firecrackers in the film turned into huge fireworks on the audio track.

“The Spies” worked on a documentary about the progress of their fellow students. At each meeting they took photos, filmed and interviewed their peers. The material they collected was edited to a film of about 15 minutes.

Observations and measures

During working with the students we experienced that the practical approach, e.g. working with an audio processing software, is very motivating for the students to immerse into a technological process because the students get an immediate audible result of their work. Another observation was that little technical knowledge supported the creativity process in the initial project development, because their imagination was not influenced by the knowledge about technological limits.

On the other hand, the students concentrated much on their musical performance, e.g. at the recording studio, instead of getting into, and experimenting with, the underlying technology. Another important observation was that students with previous experience, e.g. in using audio processing software, were likely to take the lead in their working group. So a consequence out of this was that we had focus on encouraging especially the students with little previous knowledge.

While coaching the students with their projects we were reflecting about our observations with Anita Thaler who is doing the process evaluation of EYS, and with Isabel Zorn who is an expert in gender and media-didactics. The outcome of these conversations we listed as guidelines for our current work with the students and for future projects dealing with similar topics and structures (Hofstätter et al. 2009). Some of these measures already were successfully incorporated, others take some time to show effects.

We try to

- encourage students to figure problems by themselves and try to remain reticent as experts – even under time pressure.
- give students with previous knowledge the task to support their peers – otherwise they would get bored and lost to the project.
- avoid to ally with students with previous knowledge (e.g. by using technical terms the other students do not know).
- have the students take turns in working with hard- and software (Zorn 2007).
- subtly assign technical tasks to diffident students. In showing confidence that they will do a good job we intend to reduce their fear of contact with technical equipment.
- delegate tasks and leave responsibility to the students themselves. 'Mothering' them makes the students depend on our skills and knowledge.

Final steps

The third phase is the second major part of EYS. After the students have experimented with music-related technology we are currently processing their experience to didactic concepts for music and interdisciplinary teaching and learning settings. Objective of this phase is to design concepts that should enable young people who have no practical musical competencies to produce their own sound. The concepts primarily are intended to serve teachers as inputs for how to integrate new media technology into their teaching.

The students have brought up two major ideas: recording and processing music made by various street musicians and recording and processing environmental and mechanic sounds such as wind as it moves leaves, water drops splashing, hammering, sweeping with a broom, etc. Currently we are working on the concepts which are planned to be published in the project weblog <http://eys.twoday.net>.

At the end of June 2009 there will be a final presentation in which the students show the outcome of their projects to a greater audience. Furthermore they will refer to the didactic concepts they were working on.

Literature:

Hofstätter, Birgit, Gerhard Eckel, Birgit Gasteiger, Hermann Grießer, Anita Thaler, Ulrike Weitlaner, Christine Wächter and Isabel Zorn (2009), "'Engineer Your Sound" – Partizipative Technikgestaltung im Klassenzimmer', *Soziale Technik* 1/2009, 17-19.

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