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ENGAGING AUDIO BASED MOBILE APPLICATIONS

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Abstract

Several studies have linked participation in extracurricular activities to young people's positive development and positive academic outcomes. Thus, schools are willingly co-operating with parties who can offer such activities. Museums, galleries and other cultural institutions using, for example, digital storytelling and augmented reality as part of their services, are willing to cooperate with schools by organizing extracurricular activities as one approach when trying to attract more visitors. We have developed audio platform, two different workshops and engagement measurement instrument to support these cultural institutes in organizing engaging extracurricular activities.

Our platform consists of an audio digital asset management system (ADAM), a management application, and mobile applications. The mobile applications are audio story sharing and audio augmented reality, which enable creating and sharing digital stories and soundscapes. As our audio platform aims to reach and activate young people, it is necessary also to co-operate with and motivate schools and teachers. Thus, structured and tested workshops, which fulfil extracurricular characteristics, will serve this purpose. In our case, we have developed two different workshops, which have a clear structure; are supervised by adults, and have pedagogical objectives for the participants' skill development. We have applied the student engagement structure by Fredricks, Blumenfeld and Paris in order to find out the level of engagement in workshops. By observing participants and utilizing a questionnaire, which we have developed, it is possible to measure the level of three engagement components.

We have tested our audio platform, workshop concept, and engagement measurement instrument in four separate events in Finland and Poland. The results are promising. There is a versatile audio platform, which is affordable for cultural institutions, and there is a concept to reach young people and a measurement instrument to measure the level of engagement in a workshop context.

Keywords: Audio Augmented Reality, Soundscape, Mobile Sound Mixing, Audio Story, User Generated content, Emotions, NFC, Digital Asset Management, Metadata, Android, User Experience Evaluation, Student Engagement, Extracurricular Activity, Museum.

1 INTRODUCTION

Participation in extracurricular activities is connected to adolescents' positive development. Several studies have linked these activities to positive psychological and academic outcomes [1]. Adolescents who participate in the extracurricular activities during high school have higher self-esteem and lower rates of depression. They have higher grades, test scores, school engagement and educational aspirations. Thus, schools are willingly co-operating with parties who can offer extracurricular activities. To this end, cultural institutions, like museums and art galleries organize extracurricular activities for youth. These extracurricular activities are one approach to attract more visitors. At the same time, they develop new activities, such as context-aware audio guides, augmented reality and 3D modelling based applications, and interactive digital storytelling [2, 3, 4] to provide interactive experiences for an audience familiar with of digital interaction.

To support extracurricular activities, we have developed audio story sharing and audio augmented reality platform for cultural institutions. Our platform consists of an audio digital asset management system (ADAM), a management application, and three mobile applications. The platform is modular so that an activity organiser, for instance a cultural institute, is able to pick up only those mobile applications that they need. In all cases, a back-end system is needed. ADAM contains functionalities to manage the assets, and an interface for the management application and a mobile application over the Internet. The management application is an administration console for managing the assets and users. The mobile applications are Story Sharing, NFC Writer and Soundscape Mixer, which enable creating stories and soundscapes [5, 6].

This paper introduces two workshop concepts that have utilized our audio platform. Both workshop concepts are suitable for extracurricular activities for students. A digital tool alone is not an extracur-

ricular activity. Therefore, we have defined pedagogical objectives for learning purposes. To assess, how interesting and useful a workshop and platform are we need a measurement instrument, which is capable of describing the workshop engagement. We have based our measurement instrument on the three–dimensional student engagement construct [7]. We will describe the developed measurement instrument, and how we have assessed the level of engagement in the four workshops.

2 AUDIO PLATFORM

The audio story platform is a distributed system consisting of an audio digital asset management system (ADAM), a management application, and a set of mobile applications (Fig. 1).

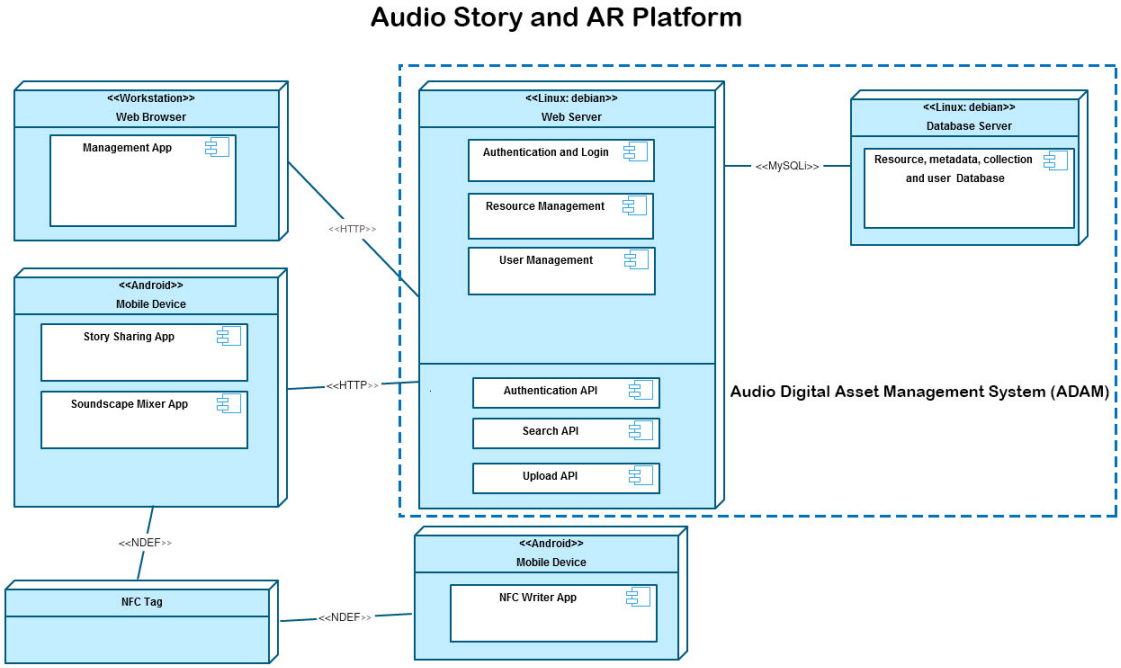

Figure 1. Audio platform architecture.

ADAM contains functionalities to manage the assets, an interface for the management application and the mobile application over the Internet. The management application is an administration console for managing the assets and users. The designed mobile applications are: a story sharing, a soundscape mixer and a NFC writer application.

Story Sharing. Our idea has been to link audio stories to some concrete objects, like artifacts in a museum. The NFC Writer application provides a way to write a user id, password, a collection id, and an artifact title into a NFC tag that is attached to the artifact. The user id and password are needed for the communication with ADAM. The collection id is a link between an artifact and related audio file collection in ADAM. The story sharing application is launched automatically when the visitor touches the NFC tag with her NFC capable Android phone. The application reads user id, password, collection id, and artifact title from the NFC tag. Now the applications have all the information in order to communicate with ADAM and find the artifact related stories. The user can listen to the audio stories related to the artifact. He or she can filter the stories based on the emotion indicators. The visitor can also record the story and define which type of emotions this story contains.

Soundscape mixer application enables to augment audio reality. Users can use their creativity and build a soundscape for a specific situation, like historical photo, story or a place. The Soundscape mixer application provides functionalities to search and listen to audio files from the audio library, recording own audio files, creating soundscapes utilizing audio library and own recordings and saving them locally.

3 MEASUREMENT INSTRUMENT

If we want to measure the level of engagement, we need to do that in some context. Even if we would have liked to study the engagement of our audio platform as a separate entity it is not possible. The role of context, action and user has been studied intensively for the last 20 years. Lately the User Experience (UX) research has tackled this topic. Although there are different opinions about the nature and scope of UX [8], the most commonly accepted definition of user experience by Hassenzahl and Tractinsky [9, 10] defines:

> ” UX is a consequence of a user’s internal state (predispositions, expectations, needs, motivation, mood, etc.), the characteristics of the designed system (e.g. complexity, purpose, usability, functionality, etc.) and the context (or the environment) within which the interaction occurs (e.g. organizational/social setting, meaningfulness of the activity, voluntariness of use, etc.)”.

Based on the UX studies we ended up evaluating how users experience workshops (and an audio platform as a part of it).

As our workshop setup was to fulfil characteristics of extracurricular activities, and the participants were typically students, we decided to base our engagement measurements on student engagement research. We will use the student engagement definition by Fredricks, Blumenfeld and Paris [7], which the vast majority of engagement researchers agree [11]. They defined the student engagement being a multidimensional structure consisting of behavioral, emotional and cognitive engagement components.

The behavioral engagement component is typically defined in three ways. We have a positive behavior aspect, such as following the rules. Then there is intentness on learning and academic tasks including behaviors, such as effort, persistence, concentration and attention. The third aspect is involvement in school-related activities. The emotional engagement component definition is based on students’ emotional reactions, such as happiness, sadness, interest, boredom, and anxiety. The cognitive engagement component links to students’ preference for challenging tasks, attention to tasks, how to master the task, and willingness to go beyond what is required.

There are several student self-report surveys [12, 13]. Only a few of them cover all three components of engagement. Our target is to use both observations and self-report questionnaires. Self-report methods are useful for assessing emotional and cognitive engagement components, which are not directly observable [11]. The behavioral engagement component is observable. Thus, we use observational methods to assess behavioral engagement. In addition, behavioral engagement assessment will be complemented by using a self-report questionnaire, as observations cannot dive into participants’ thinking or quality of effort or feelings during their activities.

As there was no existing self-report questionnaire suitable for our purposes, we decided to develop our own, which rely on three-dimensional student engagement [7]. The questions are modified from three existing questionnaires, which are targeted to the school and classroom environment: School Engagement Scale [14], Student Engagement in Schools Questionnaire (SESQ) [15] and School Engagement Survey (SES) [16]. They contain questions for behavioral, emotional and cognitive engagement components. School Engagement Scale, developed by Fredricks, Blumenfeld and Paris, provides a basis for us. SESQ divides emotional engagement questions into liking for learning and liking for school, which is not relevant for us. The SESQ behavioral engagement component covers extracurricular activities as a general concept. When filtering out direct classroom and school related questions, SESQ and SES complement our basis in all three engagement areas. After combining and modifying these three existing questionnaires, we ended up with six questions for each engagement component. As our context is two different extra-curricular activities, we have modified the questions addressing these activities.

4 WORKSHOPS AND RESULTS

We tested our workshop concepts in Poland and Finland outside the school and in school premises. In Poland, we organised two workshops for younger students and in Finland two workshops for older students.

4.1 Audio Story Workshop

4.1.1 Audio Story Workshop objectives

We defined the pedagogical objectives for the workshop as follows. After the workshop, students will understand that:

- when someone shares a memory or a story about oneself, it could strengthen the view of one's personality and/or others could see one's personality in a new light;
- sharing stories and ideas provides learning experiences;
- emotions are subjective and context sensitive.

4.1.2 Audio Story Workshop in Poland

The workshop was organized in the Gdańsk City Gallery, Poland. Workshop participants were 30 students from three different classes from a local secondary school. The age range was 13 – 16 years.

The audio platform and its usage were described in advance to teachers and gallery personnel. This enabled teachers to link the workshop to school work by asking students to prepare stories already before the workshop.

The outline of the workshop was as follows:

1 Introduction was given to workshop objectives, storytelling and audio story sharing tool. After this, the students were divided into three-person groups.

2 Each group recorded audio stories, listened to stories from other groups and took notes about stories and related emotions.

3 The most impressive stories were listened to by all and discussed.

4 Students filled in the questionnaire.

4.1.3 Audio Story Workshop in Finland

The workshop was organized at Metropolia University of Applied Sciences, Espoo, Finland. The participants were 16 first year international IT-students coming from 10 different nationalities. The age distribution was wide: 50% 20 – 25 years, 12.5% between 26 – 30 years, and 37.5% over 30 years.

Students were given three consecutive pre-tasks:

1 They were asked to select two objects inside the Metropolia building, so that they could come up with a short story related to the object. The objects could be any concrete objects inside Metropolia, like a favourite table or sofa, statue or painting or poster. In addition, it was required that there should be good Wi-Fi-coverage near the object and they should take a photo of each object.

2 All participating students were asked to select three objects out of all those objects that they found as individuals. The selection was based on the idea that each student could come up with a story, which somehow relates to one of these three objects.

3 Each participant should plan a story, which relates to one of the three selected objects. It could be a memory related to the object. It could be a story how to use that object. It could be a story describing that object. It could be a story how to design that object. It could be a story why this object is fascinating, etc. In addition, they were asked to think about emotions, which were related to their story by picking 1 to 3 positive and/or negative emotions from a list.

The outline of the workshop was quite similar to previous workshop.

4.1.4 Audio Story Workshop Results

Based on our observations, students enjoyed, were interested, concentrated, paid attention and finished the tasks. Enjoyment was observed from laughter and happiness. Students were expressing interest by willingly discussing and asking questions. Concentration and attention could be detected from the silence and keen faces when explaining the idea of the workshop and demonstrating the application, and on the other hand from relevant questions and serious discussions when it was time for discussions.

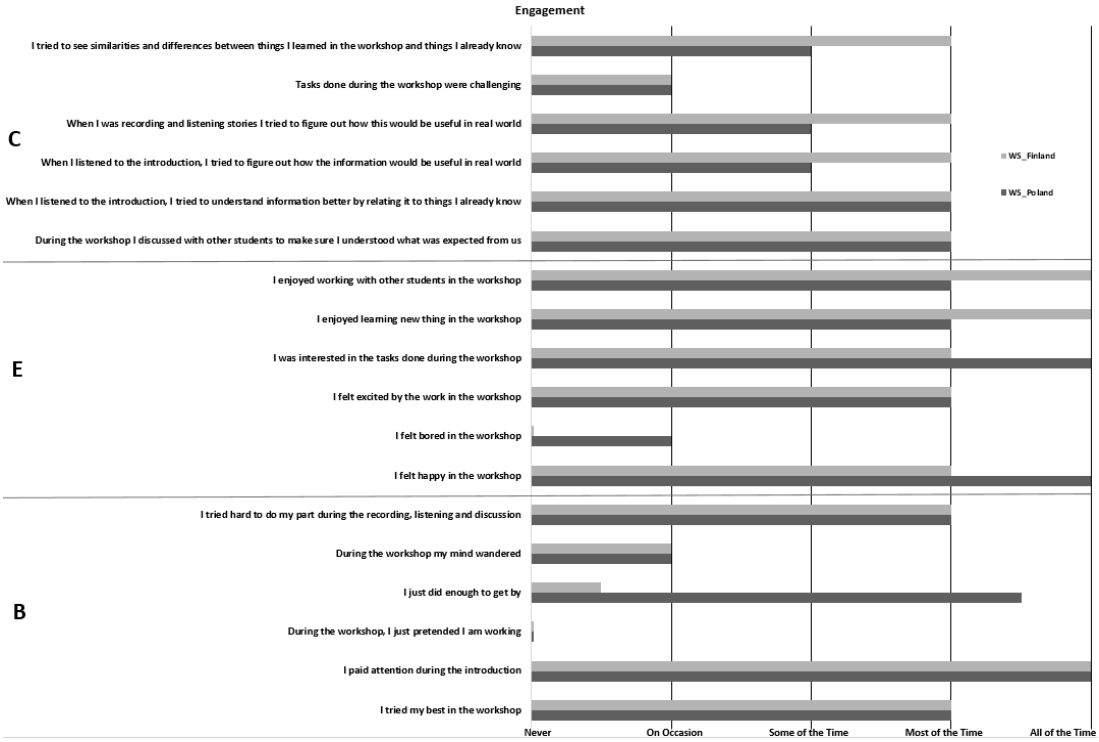

Figure 2. Engagement in audio story workshops.

In Fig. 2, we have three sections describing the three engagement components. If we look at the behavioural engagement first (Fig. 2 B), we will see that students in both workshops were putting effort and paying attention to the workshop most of the time. In both workshops, the participants reported that their mind wandered during the workshop on occasion. This could be explained in the Finnish workshop due to the waiting periods as some students were progressing much faster than others were. In the Polish workshop, students were waiting due to upload problems. The only exception is the question 'I just did enough to get by'. One explanation to this difference could be that the translation from English to Polish was not that accurate in relation to this particular question. All in all, we could see that the students were behaviourally engaged most of the time in both workshops. Emotional engagement (Fig. 2 E) related answers indicated that students were happy, excited and enjoying themselves most of the time. Only occasionally did they feel bored in Gdansk. Thus, emotionally they were very engaged. Our observations also confirms the behavioural and emotional engagement. There was a difference in cognitive engagement (Fig. 2 C) in the Polish and Finnish workshops. In the Polish workshop they paid less attention to tasks relating to a larger context, which might be at least partially explained by the age difference. In both workshops, the participants paid attention to task and to task mastery. The level of challenge for completing the tasks was not high. As a whole, the participants in the Finnish workshop were cognitively engaged most of the time, while participants in the Polish workshop were cognitively engaged only for some of the time.

4.2 Soundscape Workshop

4.2.1 Soundscape Workshop objectives

Pedagogical objectives for the soundscape workshop were to understand that:

- a soundscape is typically a composition of several sounds;
- the city soundscapes have changed due to urbanization and introduction of new technologies;
- a soundscape is a subjective experience.

4.2.2 Soundscape Workshop in Poland

The workshop was organized in the Gdańsk City Gallery, Poland. The 12 secondary school students participating in workshop came from three classes. The local school was different than in audio story workshop. The age range was 13 – 16 years.

The outline of the workshop was as follows:

1 An introduction was given to workshop objectives, soundscape and soundscape mixer tools

2 In groups, students created a soundscape for a photo. In addition, they were given an adjective that described an atmosphere in the selected photo

3 All the soundscapes were listened to and discussed

4 Student groups filled in the questionnaire

4.2.3 Soundscape Workshop in Finland

The workshop was organized at Humak University of Applied Sciences, Jyväskylä, Finland. The participants were eight Finnish Cultural Management students. The age of the participating students was 20 – 30 years.

Students were given a pre-task to find two old photos from their hometown and bring them to the workshop.

The outline of the workshop was quite similar to previous workshop.

4.2.4 Soundscape Workshop Results

We measured the engagement in both workshops. We concentrated on the atmosphere in the workshop (emotional expression), the level of participation (the activity of discussion) and the focusing to the task (time spent with the task, content of the end result). Based on observations students enjoyed, were interested, concentrated, paid attention and finished the tasks. Enjoyment was observed from vivid and informal discussion, laughter and fooling around with the mobile tools. Interest could be seen in the concentrated discussions, spontaneous reactions to the sounds they heard and thoughts, comments and questions asked. Concentration and attention could be detected from to the point questions and keen faces when explaining the idea of the workshop and demonstrating the application. Also during the group work, they collaboratively searched and tried to find exactly the sound they had in mind.

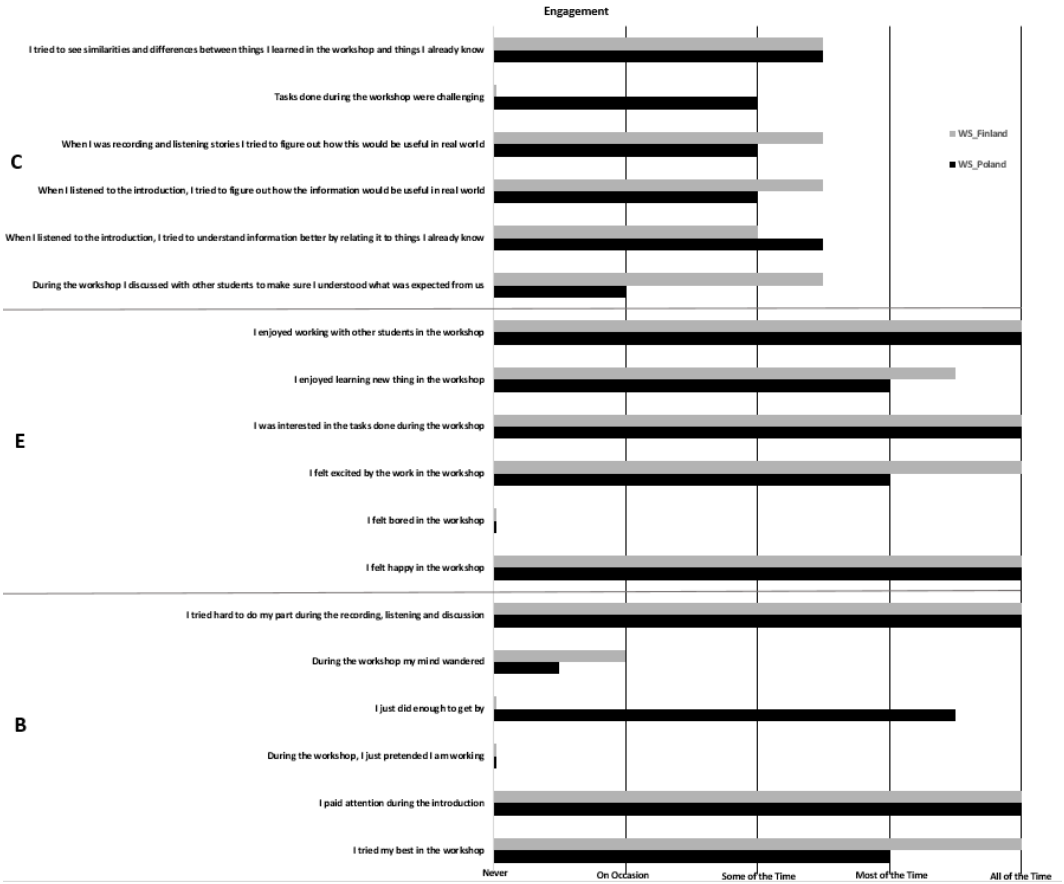

Figure 3. Engagement in soundscape workshops.

Fig. 3 is similar to Fig. 2 containing three engagement components. If we look at the behavioural engagement first (Fig. 3 B), we will see that students in both workshops were putting effort into and paying attention to the workshop most of the time. As a crosscheck, we asked if participants were just pretending to work or if their mind wandered during the workshop. Answers to these crosscheck questions confirmed that participants were really concentrating and doing their best. An interesting result is that in the Polish workshop was that they did just enough to get the work done. On the other hand, in the Finnish workshop the answers to this question also confirmed that students were doing their best. This exception was potentially explained earlier. All in all, we could see that students were behaviourally engaged most of the time in both workshops. Emotional engagement (Fig. 3 E) related answers indicated that students were happy, excited and enjoying themselves most of the time. Only occasionally did they seem bored in Gdansk. Thus, emotionally they were also engaged. This confirms the behaviour that was observed. Students were happy and laughing. They expressed interest and attention through discussions and relevant questions without negative comments. The third component, cognitive engagement (Fig. 3 C) was not as positive as the others were. It can be seen that students paid attention to the task and to some extent to task mastery, but they did not invest much in tasks relating to a larger context in the Polish workshop. The level of challenge for completing the tasks was not high in the Polish workshop and was very low in the Finnish workshop, which could be a reason why students were cognitively engaged only for some of the time. This assumption is supported by other research where they have found a relationship between challenging tasks and higher behavioural, emotional and cognitive engagement [7].

As a whole, we could see that the engagement in both workshops follows the same pattern. Emotionally and behaviourally, students were engaged most of the time. The cognitive engagement level was not as high as the other two components.

5 CONCLUSIONS

In order to reach youth and measure the level of engagement we have developed a concept consisting of a special type of workshop and engagement measurement instrument. As our audio platform aims at activating young people, we need to reach that audience. For this purpose, we need to co-operate with and motivate schools and teachers. Youth development researchers have stated that extracurricular activities have a positive impact on adolescents' development in general. Thus, teachers and other school staff see extracurricular activities in a very positive light. By applying extracurricular characteristics into a workshop, we will serve this purpose. In our case, we have developed two different workshops, which have a clear structure, are supervised by adults, and have pedagogical objectives for the participants' skill development. Cultural institutions are able to create their own workshops by applying the extracurricular characteristics guidelines.

The second part of our concept is addressing the question of how young people experience our workshops. For this purpose, we have applied the student engagement structure. Our engagement measurement instrument is based on workshop participant observations and developed a self-report questionnaire. By using our instrument, it is possible to measure the level of three engagement components during a workshop where our audio platform plays a vital part. The behavioural engagement finds out the positive conduct and involvement in learning and academic tasks. The emotional engagement concentrates on participants' affective reactions. The third component, cognitive engagement, focuses on attention to tasks, task mastery, a willingness to go beyond what is required and a preference for challenging tasks. By analysing measurements of each component separately, it is easier to improve those parts where the workshop is not up to the expected level.

In all workshops, we have taken into account four components of conceptual modelling of engaging school and out-of-school contexts [17]. Both teachers and staff have been supportive, the workshops have been adequately structured, and we have done our best to create tasks that were interesting and meaningful to be accomplished in teams. In all cases, the peer context has been positive due to similar educational background, willingness to ask questions and co-operate with others.

When applying our engagement evaluation approach we were expecting more variation on engagement results due to different cultures, age groups and venues. If we start with emotional engagement, we can see that the results in all four workshops are quite similar. Participants were happy, excited and enjoying the workshop. It did not matter if the workshop was outside the school or in the school premises. In any case, the activities during the workshops were different compared to ordinary school classes. The students from different nationalities and age groups were positively engaged most of the time whether it was a soundscape or an audio story workshop.

Behaviour-wise there were some differences. During the audio story workshops there were moments when some of the participants were having some unrelated thoughts instead of concentrating on the workshop topics. This could be due two different reasons. In Gdansk they had problems with uploading. This resulted in a situation that one of the groups was trying to upload while others were waiting. Well-functioning and reliable tools are a key factor in keeping up the engagement. A similar waiting situation happened in Espoo, as some of the students were much faster to accomplish the task. Otherwise, participants in all workshops paid attention and tried hard most of the time during the workshop, which was confirmed by observations and self-report questionnaire results. In order to get rid of unwanted waiting periods we need to revisit audio story workshop guidelines and structure.

Most of the differences could be seen in cognitive engagement. The level of challenge in the soundscape workshop was felt to be higher by young participants. Soundscape is a new concept to most of the people and this might have created the challenge. However, this did not result in higher overall cognitive engagement as was expected from earlier research [7]. On the contrary, older participants' cognitive engagement was higher even if the challenge was felt to be very low. This was also true for the audio story workshop, where the challenge level was the same in both workshops independent of the nationality or the age group or the venue. The older students were relating the contents of the workshop to a larger context, which resulted in higher cognitive engagement independent of nationality.

As a whole, this is a concept that cultural institutions could utilise when trying to reach young people through school, and which provides a measurement instrument to check the level of engagement in an audio-related workshop context.

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