

Audio Story and AR Platform for Youth Engagement

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Abstract. We have developed an audio story sharing and audio augmented reality platform for cultural institutions. Using the platform, cultural institutions can develop creative extracurricular activities. Our platform contains backend service for audio content management and three separate Android applications to support audio story sharing and augmenting reality with soundscapes. This paper introduces the results from two workshops, suitable as extracurricular activities for students that have utilized the platform. To assess how students experience workshops and the platform we have developed an instrument to measure engagement. Our instrument is based on student engagement research. With this instrument we are able to analyze not just the engagement as a whole but also the behavioral, emotional and cognitive engagement components. Workshops create holistic experiences; thus, we need to take into account the platform and context when measuring user engagement.

Keywords: Student engagement · Soundscape · Audio story · Android · Audio augmented reality · Extracurricular activity

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, art galleries and libraries 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 modeling based applications, and interactive digital storytelling [2–4] 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 a user, 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 workshops that have utilized our platform. Both workshops are suitable as extracurricular activities for students. As a part of the workshop concept we have defined pedagogical objectives for learning purposes. In the workshop chapter we will describe pedagogical objectives in a more detailed level. 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] as most engagement scholars agree on that definition [8, Epilogue]. We will also describe the developed measurement instrument and how we have assessed the two different workshops.

2 Audio and Extracurricular Activity

Museums, art galleries and other cultural institutions have for long cooperated with educational institutes to provide another aspect into the studied subjects. We have developed a platform for sharing audio stories and augmenting audio reality by using soundscapes. The stories are often curated and to some extent they are interactive like Holocaust Survivor's interactive storytelling [9]. To provide advanced interaction, the interactive digital storytelling research is looking for ways to provide a platform, which combines a game engine and an interactive curated narrative environment [10]. These examples rely on visual and audio elements. In recent years tangible narratives have emerged which use tangible user interfaces. One example in museum context is smart replicas [11]. When a replica is placed into a case that contains a NFC tag, a curated story will be triggered. Some projects, like Object stories and 100 toys, have invited visitors to participate by telling their own story [12]. Our platform concentrates on audio presentation. It supports also curated audio stories, but we differentiate from the other digital storytelling systems by allowing the visitors to indicate emotions onto the visitor stories. There is also a possibility for combining soundscapes and audio stories as visitor enriched audio stories. In addition, the modularity allows cultural institutions to select the appropriate elements they deem suitable for their aims, which is important for easy appropriation by the cultural institutions. They need to have a choice on how and what to use for tying the exhibitions to the pedagogical aims of nearby educational institutions.

In augmented reality, we have focused on the acoustic environments. A soundscape is created out of multiple, time-varying sound sources [13]. When a user creates a soundscape, which describes the acoustic environment of some location, we can say that soundscape forms audio augmented reality. Location aware soundscapes combine typically location-based mobile applications and audio. Tactical Sound Garden platform enables users to leave location-based sounds and other users to listen to them in that

particular position [14]. Klang.Reise is an installation of video and audio recordings inside a closed spherical space [15]. The goal is to demonstrate different sounds of a selected place and how these sounds change over the time. The Sound Design Accelerator (SoDA) project provides software for soundscape generation. SoDA is targeted to sound designers [16]. Our approach is somewhere in between these, the target audience being museum visitors, such as students, as was in Klang. Reise project. Just like in Tactical Sound Garden, we are asking visitors to share soundscapes. The difference is that we expect users to create the soundscapes from simple sound components (audio files) available in the backend system. We do not expect visitors to be familiar with reverberation, resonance, or other acoustic terms, which makes it easier to appropriate the use of the application smoothly. Thus, our application is in well-established genre, but we have enhanced the way it can be used based on the previous projects experiences. We have also created an implementation for cultural institutes which is easier to execute [17]. Next we will explain our framework and engagement measuring instrument for the extracurricular activities.

3 Developing the Measurement Instrument

Engagement as a term and structure has several definitions. Some researchers define engagement as a synonym for motivation [18, 19], relying on motivational theories, such as flow theory, interest theory and self-determination theory. In recent years there has been increased research on engagement, where engagement and motivation have been defined as separate constructs. Today, most motivation and engagement researchers agree that motivation is the precursor of engagement, where motivation is intent and engagement is action [8, Epilogue]. As our context is extracurricular activities we will rely on the student engagement definition: multidimensional structure consisting of behavioral, emotional and cognitive engagement [7, 8, Epilogue].

In a study [18] the extracurricular activity experiences were measured and compared among middle school students. This research covered activities from sports and arts to socializing, academic enrichment and sit-down games. This was a one-year study with two one-week data sampling periods using Experience Sampling Method (ESM). Students were positively engaged and exhibited high intrinsic interest and concentrated effort during sports and arts. Positive emotion was highest in sit-down games, arts and academic enrichment activities. Concentrated effort was lowest when socializing. Importance was lowest when socializing and during sit-down games [18]. These results point out how differently students experience the extracurricular activities depending on the type of activity. For us the results give a good example of the importance creative activities have for broader success in students' studies.

The engagement research has emphasized the understanding of contextual factors. In situ instrument is one that aims to capture students' real situation – specific experiences of engagement that could not be assessed with traditional questionnaires. It emphasizes the importance of investigating situation-specific variations in engagement [8, 20]. The findings support the idea that moment-to-moment experiences of engagement may congeal to long-term engagement trajectories [8]. In the in situ instrument,

factors of behavioral and cognitive engagement become mixed and hard to distinguish from each other. As behavioral and cognitive aspects are closely related, also we are paying attention to them in our research. Although, the in situ instrument and related research have provided understanding of the factors that influence student experience, there is limited information on how physical learning spaces affect student engagement. Previous research has shown that an institution's physical environment has significant implications on teaching and learning processes as well as social practices [8, 21, 22]. Bennet has argued that physical spaces and tools influence learning behavior, as different spatial designs determine activities in which students can and cannot engage [23]. The impact of physical spaces becomes more prominent when pedagogical practices move away from the traditional, teacher-centered approach towards a more flexible, student-centered approach and non-school environments such as museums. From a social constructivist viewpoint, this interaction is a vital component in the creation and development of knowledge [24, 25]. In our framework, we cannot separate the tools used and context where the actions occur.

The measurement instruments of student engagement vary a lot. This is due to the fact that student engagement structure has been defined with different number of subcomponents and even if researchers are using the most typical three component structure then there has been variations in the content of items describing subcomponents. We are using the definitions from Fredricks, Blumenfeld and Paris [7]. Behavioral engagement is most commonly defined in three ways: positive conduct, such as following the rules, involvement in learning and academic tasks including behaviors, like effort, persistence, concentration and attention, and participation in school-related activities. Emotional engagement refers to students' affective reactions, like interest, boredom, happiness, sadness, and anxiety. Cognitive engagement refers to attention to task, task mastery, a willingness to go beyond what is required and a preference for challenging tasks. The types of engagement are interrelated, but there is no clear evidence how different types of engagement interact. For example, it is likely that emotional engagement leads to increases in behavioral and cognitive engagement [7].

On methods how to gather the data, the most common for studying engagement include student self-report surveys, experience sampling, interviews and observations. In Handbook of research on student engagement, a comparative analysis of various methods and 11 self-report instruments has been described [26]. Another study contains 21 instruments: 12 student self-reports, 3 teacher reports, and 4 observational measures. Out of the 12 student self-reports only 5 include subscales that address all three dimensions of engagement [27]. Our target is to use observations and self-report questionnaires. As described in [8, pp. 765–768] self-report methods are useful for assessing emotional and cognitive engagement, which are not directly observable. Behavioral engagement is observable. Thus we use observational methods to assess behavioral engagement. In addition, we will use also a self-report questionnaire, as observations do not provide information on participant's thinking or quality of effort or feelings during activities. The self-report questionnaire is relying on three-part typology of student engagement [7]. Questions are adapted and modified from School Engagement Scale [28], Student Engagement in Schools Questionnaire (SESQ) [29] and School Engagement Survey (SES) [30]. All three questionnaires are targeted to school and classroom

environment. They contain questions for behavioral, emotional and cognitive engagement. School Engagement Scale is developed by Fredricks, Blumenfeld and Paris. This questionnaire provides a good starting point including the Likert scale. SESQ divides emotional engagement questions into liking for learning and liking for school. Liking for school in our case is not relevant. In SESQ behavioral engagement takes into account extracurricular activities as a general concept. Both SESQ and SES have several relevant questions in all three engagement areas. When filtering out direct classroom and school related questions we have been able to pick up six questions for each engagement areas. As our context is two different extracurricular activities we have modified questions addressing these activities.

Qualitative methods (self-report questionnaires and observations) were used to understand the quantitative data gathered [31]. Using a qualitative paradigm illuminates the people behind the numbers and helps to understand what is observed, it provides richer understanding than mere statistics [32]. The qualitative methods also support the three measurement components: observation allows studying of behavioral aspect especially when mixed with self-reporting questions related to behavior and cognitive aspects. The questionnaires allow us to understand the emotional aspects of the users that cannot be seen from behavior. Our workshops require intense work and thus are not huge in participant numbers which makes it hard to generalize the findings. The studies are case studies, mixing quantitative and qualitative data.

4 The Gdańsk City Gallery Workshops and Results

Two workshops were organized in the Gdańsk City Gallery, Poland. Workshops aimed at studying student engagement in activities organized in the City Gallery using our platform. The focus of the first workshop was the level of engagement during the workshop where students share their own audio stories. In addition, we studied how easy/difficult the interaction with the Audio Sharing application is. The second workshop concentrated on soundscapes. We aimed at understanding the level of engagement during the workshop and verify if the interaction with the Soundscape Mixer application was experienced as easy as it was in the Finnish museum context [17].

Both workshops had a pedagogical plan. Pedagogical objectives for the audio story workshops were to understand that: sharing a memory or story about yourself could open a new angle to one's personality or strengthen the existing view of one's personality; sharing ideas is an important part of learning; emotions are dependent on context and person; and if a story is related to some artifact, then the user should understand that different stories demonstrate how an artifact can be described from many different angles. Pedagogical objectives for the soundscape workshop were to understand that: a soundscape is a composition of several audio components; urbanization and technology have changed the city soundscape and that a soundscape is a subjective experience.

The framework used was the student engagement structure with three components [7] consisting of questions relating to emotions, behavior and cognitive aspect of engagement. There were six questions per component. As part of behavioral engagement we asked how much and how long student was concentrating, putting effort, and paying

attention to workshop or was her/his focus somewhere else. Emotion wise we asked how much interest, boredom, happiness, excitement and enjoyment students had. In order to understand cognitive engagement we asked about level of challenge, attention to task, task mastery, and a willingness to go beyond what is required. Questions from different components were mixed in a questionnaire. Three questions were reverse scored to prevent individuals from adopting a rapid response pattern with the Likert scale ratings without reading the question. In addition to engagement related questions, we checked also how familiar students were with the smart phones and how easy/difficult the interaction with the mobile application was (Fig. 1). Audio Story and Soundscape Questionnaire had almost the same questions. Only questions 12 and 16 of engagement part and last two questions of application interaction part were modified to be more related to workshop and application context.

Audio Story Query

Your mobile phone

	iPhone	Android phone	Windows phone	Other	I don't have a phone
What kind of mobile phone do you use?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
think about the workshop from start to end (from introduction to discussion) when you answer the questions below					
	Never	On Occasion	Some of the Time	Most of the Time	All of the Time
I tried my best in the workshop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt happy in the workshop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
During the workshop I discussed with other students to make sure I understood what was expected from us	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I paid attention during the introduction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt bored in the workshop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I listened to the introduction, I tried to understand information better by relating it to things I already know	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
During the workshop, I just pretended I am working	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt excited by the work in the workshop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I listened to the introduction, I tried to figure out how the information would be useful in real world	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I just did enough to get by	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was interested in the tasks done during the workshop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I was recording and listening stories I tried to figure out how this would be useful in real world	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
During the workshop my mind wandered	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I enjoyed learning new thing in the workshop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tasks done during the workshop were challenging	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tried hard to do my part during the recording, listening and discussion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I enjoyed working with other students in the workshop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tried to see similarities and differences between things I learned in the workshop and things I already know	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How would you grade the Audio Story application?					
	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Pleasant to use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Worked well	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Was fitting to the task	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have you used similar applications before?	<input type="radio"/> Yes			<input type="radio"/> No	
Would you use the app elsewhere than in this workshop?	<input type="radio"/> Yes			<input type="radio"/> No	
Did you know what the icons meant?	<input type="radio"/> Yes			<input type="radio"/> No	
Did you succeed in recording your story?	<input type="radio"/> Yes			<input type="radio"/> No	
Did you succeed in listening stories?	<input type="radio"/> Yes			<input type="radio"/> No	

Fig. 1. Audio story workshop questionnaire

For studying both workshops we used mixed methods with the selection of methods – observation and self-reporting questionnaires were used – and with the analysis. Three researchers were present at the place where the observations were made. Data was gathered by observation notes, and notes from discussion between the researchers on the place. The notes were rewritten to clear them up. The self-reporting questionnaires in paper format were collected at the end of workshop. For analysis we used the data gathered from the workshops. We executed simple statistical measurements from the

self-reporting questionnaires. These were combined with the observation and discussion notes data. We also used the researchers' impression and experiences from the workshops. However, while we had three researchers in the workshops executing the observation, we had two researchers analyzing the data. One of the researchers analyzing the data was not present in the workshops. Thus, allowing a different view into the data while the other researcher had the self-experience also available for analyzing the data. Therefore, we can say that we used triangulation with the data gathering and analysis [33]. Both studies were conforming to the ethical guidelines, and consent forms were signed by all students taking part in to the workshops.

4.1 Audio Story Workshop

The Gdańsk City Gallery was selected to be the workshop place for two reasons: they have good connections and experience in working with local secondary schools, and we wanted to test our platform also in other country than Finland. The workshop was organized in cooperation with teachers from the secondary school Gdansk, Poland and the gallery personnel. With the teachers and gallery personnel the pedagogical aims were designed. The platform and its usage were described beforehand to teachers and gallery personnel. This enabled teachers to link workshop to school work by asking students to prepare stories already before the workshop. Students were also asked to think about the emotions related to their stories.

Our research question was: can a student get engaged when sharing a personal story with other students. In addition, we wanted to know if our Audio Sharing application hinders or supports the activities. The participants were 30 students from three different classes from a local secondary school. Age of the students was between 13–16 years, which match well to our target group. Our initial plan was as follows:

1. The gallery personnel welcomed the young people and explained the idea of the workshop. This included a discussion about storytelling and what kind of personal experiences students have on storytelling. After this Sound Sharing application was introduced. Finally, students were divided into team of two, each team has a number, and the task was provided for the students (20 min).
2. Each team was pointed out a location in a gallery, where they could find a paper on the wall with a number (same as their team number) and NFC tag. Team locations were planned so that they would not disturb each other and there would be sufficient WLAN coverage. The task was to record both student stories and then listen to stories from two other groups. When listening stories the students were advised to take notes to decide which stories were most impressing. The students were provided a user identifier and password to log into ADAM in order to upload their stories. The students had an Android device provided by us and Sound Sharing application in their use for recording and listening stories (40 min).
3. In the end, most impressing stories were listened and discussed. Feedback of the workshop was provided by the students. Each student filled a questionnaire (Fig. 1) at the end of the workshop (30 min).

Initially we planned a workshop for 20 students as we had only 10 Android phones with us. So it was a surprise when we got 30 students. We modified our plan on the fly by defining the team size to 3 and asking teams to select two stories out of three, which they would record. In the actual workshop both introduction and the recording and listening stories took longer than planned almost hour and a half, which meant that the whole workshop lasted 2 h. We split the students into two different spaces to give them more space when using the mobile application. We had one researcher per space. After 1.5 h the listening of the stories began. Gallery personnel translated these stories afterwards from Polish to English to us. The outcomes were analyzed from the questionnaire data, video and observation notes.

4.2 Results of the First Workshop: Observations and Questionnaire

Observations were conducted by two persons. When analyzing the notes and video taken during the introduction, the following issues came clearly visible: students enjoyed, were interested, concentrated, paid attention and finished the tasks. Enjoyment was observed from the laughter and happiness. Interest could be seen from the willingness to discuss and ask questions. Concentration and attention could be detected from the silence and keen faces when explaining the idea of workshop and demonstrating the application, and on the other hand from relevant questions and serious discussions when it was time for discussions. Topics of discussion were stories, which came to students' minds during the introduction, how emotions are subjective, time and place related, what kind emotions were raised after hearing someone's story. Both researchers had similar observations related the usage of applications. Students were willing to ask questions, were happy and helped each other to accomplish the tasks.

We also noticed hindrances. One of it was when several students could not upload their stories to the system. The students were quite understanding and continued working in a good mood, which might indicate that working with the stories was interesting enough not to bother too much on technical problems. It was agreed with the students that we listen to two stories, which would be told orally by students who did not succeed to upload their stories, and two stories, which were uploaded into ADAM. All these stories were very personal including the emotions related to stories. While one student was telling his/her story all other students were listening carefully. There was no negative behavior during or after the story telling. Neither there were any negative comments. On the contrary, the comments were supportive and positive. Thus, we could see that the students had done the school/home work for the workshop, and as hoped presented their emotionally rich stories. Based on these stories, discussions and the behavior of the participants it was clear that they took the workshop very seriously.

When observing the use of the application it seemed that the students did not have any other problems after they learned where the phone's NFC reader (needed to start the application) is located. This was confirmed by both researchers. Because there was no hesitation in the use and no questions of the usage of the mobile application, we could assume that the application worked smoothly and it was easy to use.

Based on observations and discussions with students it was obvious that the Gallery as an environment had a positive impact on the workshop. Students were excited about the place and at the same time relaxed. They looked at paintings on the walls and video art, but art works did not prevent them from accomplishing their tasks.

The questionnaire provides more detailed information about engagement and some additional information of the application. If we look at the behavioral engagement first, we will see that students were putting effort and paying attention to the workshop most of the time. According to their answers they were concentrating and not just pretending to work. An interesting result is that they did just enough to get work done. This could relate to a cognitive answer where students indicate that tasks were challenging for only some of the time. All in all we could see that students were behaviorally engaged most of the time (Fig. 2B). Emotional engagement related answers indicated that students were most of the time happy, excited and enjoying themselves. Only occasionally did they seem bored. Thus, emotionally they were engaged (Fig. 2E). This confirms the behavior that was observed, laughter, happiness, interest, discussions and relevant questions, no negative comments, and attention. The third component, cognitive engagement was not as positive as the others. It can be seen that they paid attention to task and to some extent to task mastery, but they did not invest much on tasks relating to larger context. As discussed, the level of challenge for completing the tasks was not high, which could be areas on why students were cognitively engaged only for some of the time (Fig. 2C). This assumption is supported by [11] where authors found a relation between challenging tasks and higher behavioral, emotional and cognitive engagement [7].

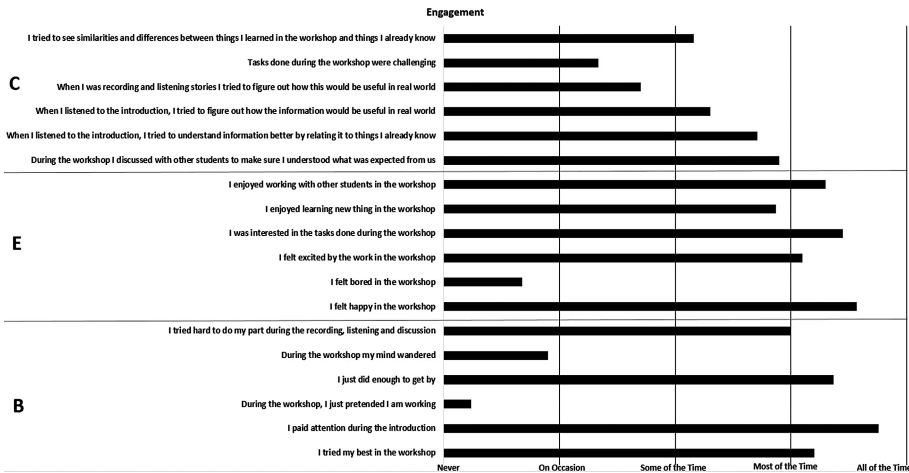


Fig. 2. Audio story engagement

Considering that six users had an iPhone, two users had a feature phone and 23 had an Android phone in their private use, it was expected that users would find the application easy to use – even if most of the users noted that they had never used a similar application. Students indicated that our application was suitable to the task and pleasant to use. Problems with uploading clearly affected the user experience when analyzing

student answers on how well the application worked, how many had succeeded in recording their stories, and to some extent also during listening to the stories after recording. In spite of the problems most of the students were able to complete the tasks, and would use similar application elsewhere than this workshop. Almost all students were able to recognize icons (Fig. 3).

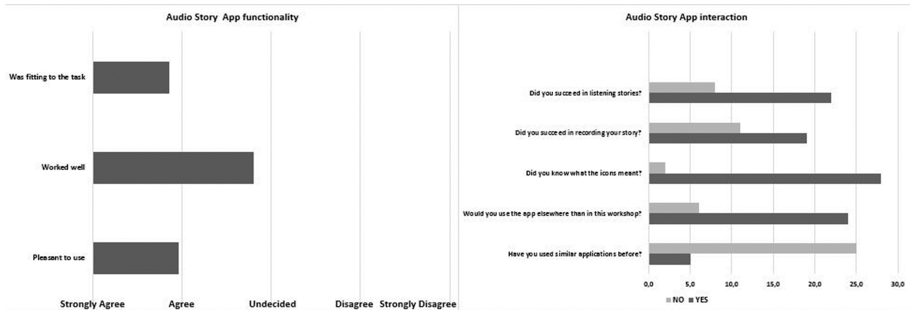


Fig. 3. Audio story application functionality (left) and interaction results (right)

4.3 Soundscape Workshop

The second workshop was also organized in the Gdańsk City Gallery. It was more focused, as its main purpose was to study engagement of creating soundscape. In addition, we wanted to know if our soundscape mixer application hinders or supports the activities. We have previously organized two similar workshops in Finland [17]. Thus we had already earlier experience how to define relevant pedagogical aims. We agreed with gallery staff to use the same pedagogical approach and objectives as in Finland. We decided to use SoundSpace application, which is one of the three soundscape mixer applications. We have used SoundSpace also in previous two workshops.

Our research question was: Can a student get engaged when creating soundscapes. In addition, we wanted to know if our soundscape mixer application hinders or supports the activities. The 12 student participants from three classes came from different secondary school this time. Age of students was between 13–16 years. These classes were from Gdansk, Poland. The outline of the workshop was as follows:

1. The gallery personnel welcomed the young people and explained the idea of the workshop. Sound design teacher explained what a soundscape is, and SoundSpace application was introduced. Finally, a task was provided for the students (20 min).
2. The task was to create a soundscape to an image of historical Gdansk. For creating the soundscape the users were provided an image and an adjective that exemplified an atmosphere into the selected image. The users were given a user identifier and password to log into ADAM and a sound collection identifier to choose sounds from. The users had SoundSpace application in their use for creating the soundscape. The devices used were Samsung Galaxy and Nexus phones equipped with headphones. The students created the soundscapes in pairs (30 min).

3. In the end, all the soundscapes were listened and discussed. Feedback of the workshop was provided by the users. Each student filled a questionnaire after creating their final soundscape (Fig. 1) (20 min).

The workshop went as planned. The workshop was bi-lingual in a sense that a short intro was done in Polish and rest of the workshop was in English. This enabled both researchers to observe the workshop in real-time.

4.4 Results of the Second Workshop: Observations and Questionnaire

The observations were conducted by two persons. When analyzing the notes and video taken during the whole workshop, we had similar results compared with the first workshop: students enjoyed, were interested, concentrated, paid attention and finished the tasks. Enjoyment was observed from the laughter. Interest could be seen from the discussions, comments and questions asked. Concentration and attention could be detected from the point questions and keen faces when explaining the idea of workshop and demonstrating the application. Topics of discussion were sounds and soundscapes, which students experienced on their way to the gallery, how soundscapes are subjective, and how the soundscapes can be time and place related. Students did not have any problems using the application, they were discussing intensively when planning what kind of sounds were needed to create a soundscape which best describes the image and given adjective. They were eager to try out different sounds and helped each other to accomplish the tasks. When it was time to listen to all the soundscapes we decided that each pair displays their image and then we listened the soundscape. After listening the soundscape, other students were asked to guess what the given adjective was. This clearly intensified the listening experience as other students had to concentrate figuring out the adjective. The experienced sound designer researcher was commenting all soundscapes and students were keen to get her comments. Based on her assessment all the soundscapes were creative and proved that students took this task seriously and put effort and creativeness to come up with soundscapes. When observing the usage of the application, it seemed that the students did not have any problems. This was confirmed by both researchers. Because there was no hesitation in the use, no questions of the usage of the mobile application, we could assume that the application worked smoothly and it was easy to use.

The questionnaire provides more detailed information about engagement and some additional information of the application. If we look at the behavioral engagement first, we see that the students were making an effort and paying attention to the workshop most of the time. According to their answers they were concentrating and not just pretending to work, but they did just enough to get the work done. As in the other workshop, this behavior could relate to the cognitive answer where they indicate that tasks were only some of the time challenging. All in all, we could see that students were behaviorally engaged most of the time (Fig. 4B). Answers related with emotional engagement indicated that students were happy most of the time, excited and enjoying themselves. Only on occasion they were bored. Thus, emotionally they were engaged (Fig. 4E). This confirms the behavior that was observed, happiness, interest, discussions

on relevant questions, attention and no negative comments. The third component, cognitive engagement was not as positive as the other two. It can be seen that attention was paid to the task and to some extent to task mastery, but not much was invested on relating tasks to larger context. To relate the workshop tasks to a broader context might have needed guidance from teachers. The meta-skill of reflecting in a broader sense is challenging (Fig. 4C). This assumption is supported by other research where they have found a relationship between challenging tasks and higher behavioral, emotional and cognitive engagement [7].

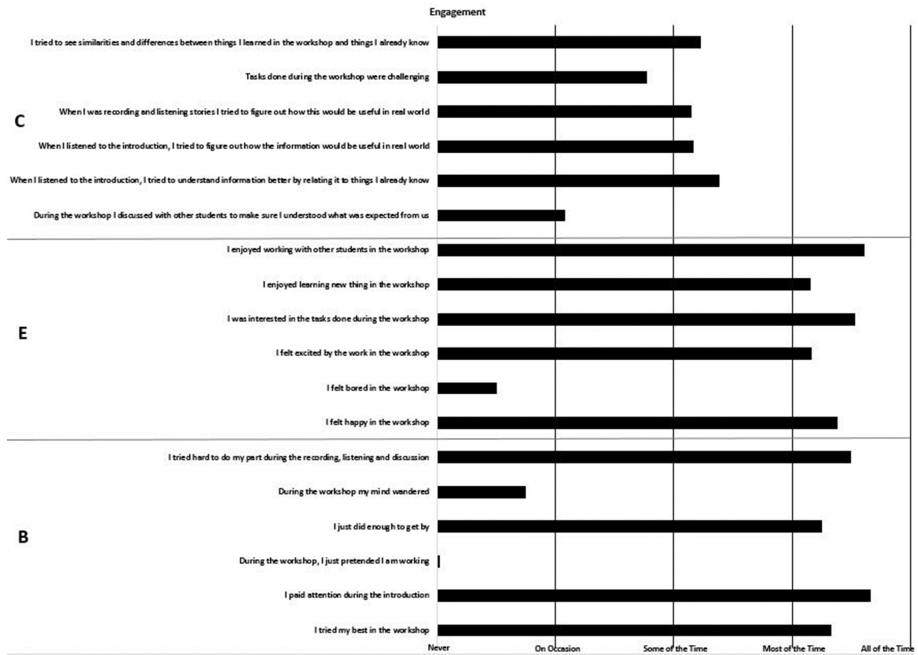


Fig. 4. Soundscape engagement

As four users had an iPhone and eight had an Android phone in their private use, it was expected that using an Android application was easy – even if most users noted that they had never used such application. Students indicated that our application was suitable for the task, pleasant to use and worked well. All of the students were able to complete the tasks, and most of them would use a similar application elsewhere than this workshop. Almost all students were able to recognize icons (Fig. 5). These results are similar to our earlier results collected from two workshops in Finland [17].

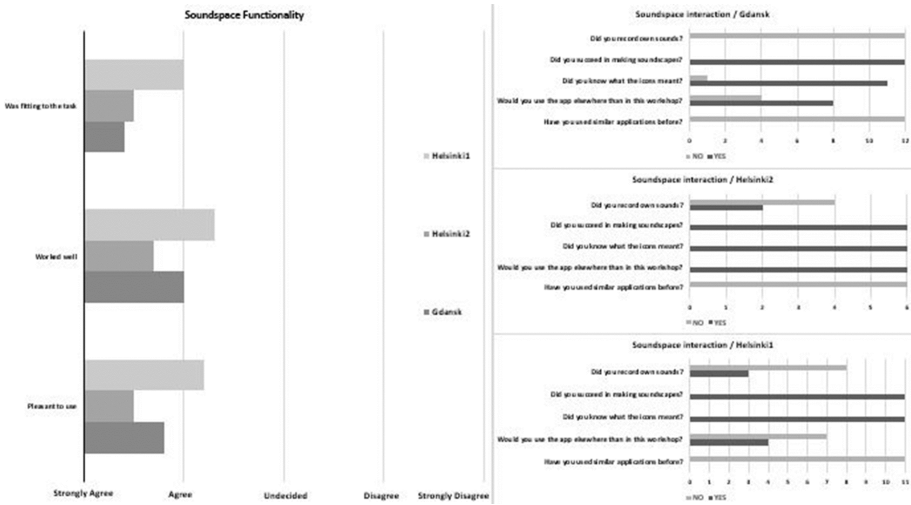


Fig. 5. SoundSpace application functionality results on the left and interaction results on the right. Results from the Gdansk workshop and also from two earlier workshops.

5 Conclusion

In this paper we have described an instrument to measure the student engagement during extra-curricular activities. Our instrument is based on student engagement research. Utilizing this instrument, we are able to analyze engagement in general as well as behavioral, emotional and cognitive engagement components, allowing us to assess how students experienced a workshop and our platform [5, 6].

We organized two workshops with two aims: (1) can a student get engaged when sharing a personal story with other students or when creating a soundscape (2) do our Android applications hinder or support the activities. Based on the findings, we can say that workshops using our platform have been engaging experience for the students, and they were behaviorally and emotionally engaged most of the time. Cognitive engagement was not as positive as the other two - the students paid attention to the task and to some extent to task mastery, but they did not invest much in relating tasks to a larger context. Still, based on the findings we can state that the interaction with audio story sharing and soundscape mixing applications was appreciated.

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