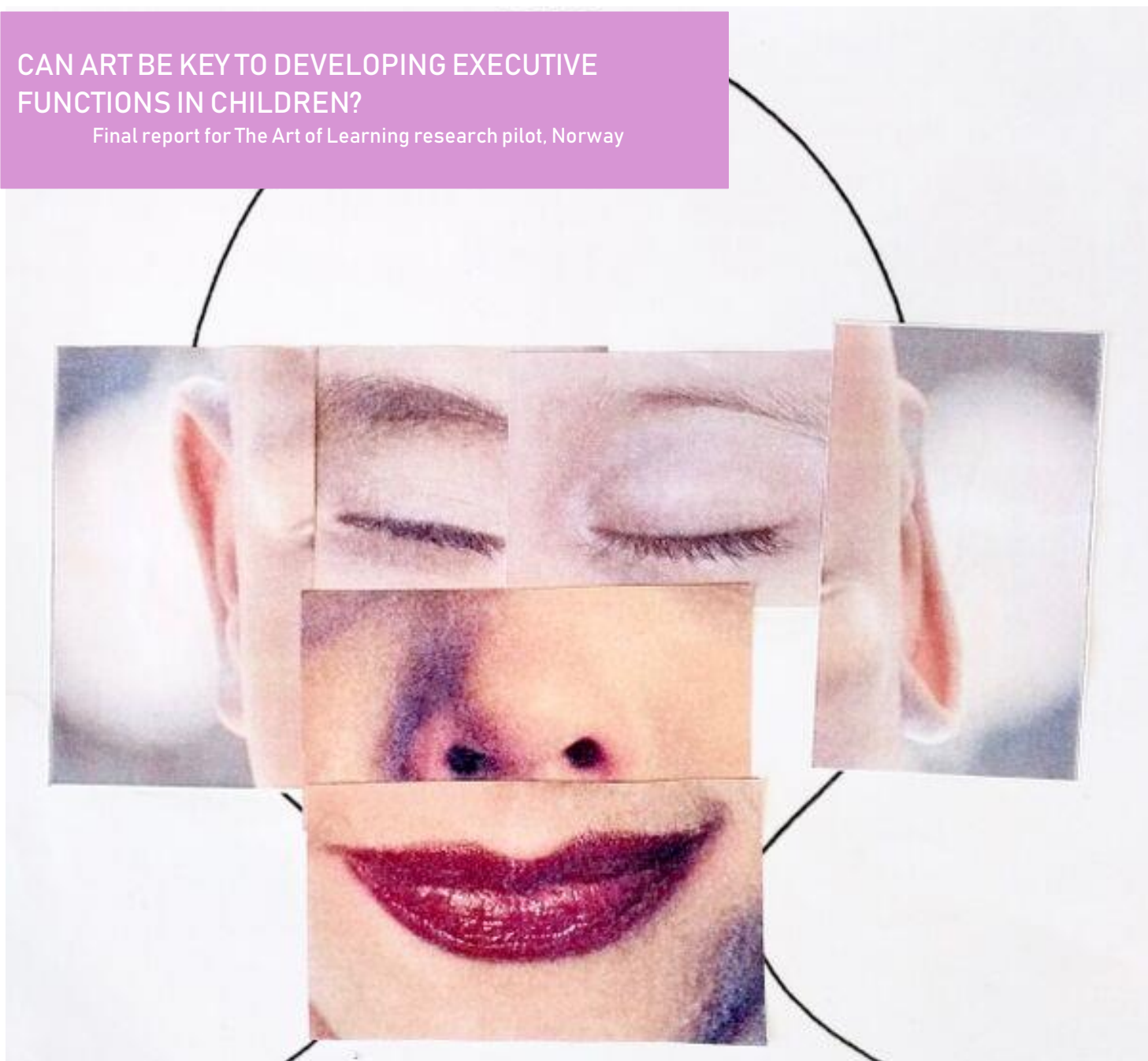


CAN ART BE KEY TO DEVELOPING EXECUTIVE FUNCTIONS IN CHILDREN?

Final report for The Art of Learning research pilot, Norway



Oppland fylkeskommune og Høgskolen Innlandet, Norway, March 2019



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Developer of The Art of Learning (AoL) and professional advisors in the implementation of the intervention: Creativity, Culture and Education (CCE).

About the authors

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Preface

From 2013–2017, Oppland County Municipality has implemented Creative Partnership, a program that brings artists into the school for long collaborations with a teacher and a student group, in schools in the county. The initiative arose as a continuation of the support scheme Kriblemidler (funds intended to stimulate tingling or thrill in schools) within The Cultural Rucksack, and was created with inspiration and support from Creativity, Culture and Education (CCE) and its program Creative Partnerships in England.

After four years of efforts, we had several good anecdotal results from the work, but we felt that we lacked tangible, verifiable results. We therefore wanted to take one step back and get clearer answers to the value of working long-term with the arts and creativity in school, with a vision to further extend the work in future.

In the beginning of 2017, we got interested in a newly started research project in Scotland, The Art of Learning, which seemed intriguing and relevant. The project hypothesized that "Rich, creative and art-based education has a positive effect on the executive functions of the brain". It was a collaboration between Education Scotland, Creative Scotland, CCE, Centro de Desarrollo de Tecnologías de Inclusión (CEDETI), a research institute at Pontifical Catholic University in Chile and local authorities in North Ayrshire, Scotland.

We invited with us representatives from Norway whom we thought would have an interest in the research project, and in March 2017 a delegation went from Norway to Ayrshire in Scotland to observe and talk with the research team, the partners and participants in The Art of Learning. Attending from Norway: Associate Professor Per Normann Andersen from INN, researcher with executive functions as field of study, Merete Hassel from the National Center for Art and Culture in Education, Ane Roggen from the research department at Kulturtanken, rector Kjell Tangerud and teachers Sylvia Volden and Lene T. Amrud from Fåvang school in Oppland county, as well as Marie Othilie Hundevadt from Culture dept., Oppland County Office.

Following the visit, all parties showed interest in initiating similar research in Norway, and thus the research pilot The Art of Learning arose. Additionally, CCE, CEDETI and primary schools in Ringebu, Dovre, Øyer, Lillehammer and Gjøvik municipality became partners. Preparations for the pilot were made in the autumn of 2017, the implementation in 2018, and the follow-up is now being completed, early in 2019.

The authors want to thank all the schools, teachers, students and artists who worked hard in the service of research, all partners who have made the work possible, and last but not least Per Normann Andersen for academic support, correction and assistance throughout the writing process.

Lillehammer, March 4, 2019

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Summary

In this research pilot, we have studied what possible improvement of executive functions (EF) an implementation of a 12-week, rich, art-based learning program called The Art of Learning (AoL) might bring to the children involved. AoL was tested in primary schools in Gjøvik, Lillehammer, Øyer, Dovre and Ringebu municipalities in Norway. The main purpose of the study has been to increase knowledge about improvement of EF in children and to consider if a curriculum using the arts as a method is beneficial for the development of EF as compared to standard teaching methodologies practiced in primary schools in this part of Norway. The results can contribute to better understanding of EF's development; it can help understand what happens when children work with the arts, and possibly benefit treatment of EF impairments.

After going through all collected qualitative and quantitative data, the results clearly indicate that a curriculum using the arts as method over time is beneficial for the development of EF in children. The group of children who took part in the AoL had a significantly better development of their EF than the control group. Additionally, schools report that their classes have become better at cooperation, the children have fewer conflicts amongst each other, and the children are able to keep track throughout longer conversations than before. They also report children feeling safer in their class and groups where everyone feels included. Teachers also report how the pupils have improved their vocabulary and some teachers feel that life as a teacher has become easier.

Now that the project has ended, we are left with positive results, reflections around strengths and weaknesses of the study, and thoughts around ways of moving forward. This project has been a pilot in a minor scale, and we are more than willing to find out what results a similar major research project in future might bring.

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1. INTRODUCTION

Basically, it may seem odd to compile brain research and pedagogy with the arts and culture, but in this case, it might be precisely what should turn out to be logical. Adele Diamond (2012)¹ writes about the EF of the brain:

Because EF are critical for academic achievement, a society that wants its students to need to take seriously that the different parts of the human being are fundamentally interrelated. If emotional, social, or physical needs are ignored, this will work against good EF and hence against academic excellence.

In other words, she says that if children and young people are not intellectually, physically, socially and emotionally stimulated and engaged, it will work against the development of their EF, and this will in turn inhibit their real capacity to learn. Furthermore, childhood executive functioning is associated with both quality of life and the ability to overcome a range of challenges in adolescence and adulthood.

Studies conducted on programs where artists have been in schools for a long time, e.g. Cambridge University's report *The Impact of Creative Partnerships on the Well-Being of Children and Young People*² and Nottingham University's Report *The Signature Pedagogies Project*³ shows that when artists come into school, cooperation, feelings, use of the body, movement, play and risk taking, are central parts of the work for the pupils. In this work the students get to use their whole selves in the activities. The studies point out that students in work with artists in the school are both physically, socially, emotionally and intellectually engaged.

It therefore seems reasonable to think that artists and arts activities can be a key in order to create a framework in which students are physically, socially, emotionally and intellectually engaged, which in turn is precisely what Diamond claims, among other things, is required for the EF of the brain to be developed effectively, and for the students to utilize their capacity to learn - in school as well as in life in general.

Through this research pilot, we will investigate whether this interconnection has real substance, something which in turn can be investigated even more closely.

1.1 Objectives and hypothesis

The overall objective is to create new research by examining whether a 12-week diverse, arts-based learning program in school can have a positive effect on the pupils' development of their executive functions.

1

Executive Functions - Annual Review of Psychology Vol. 64: 135-168 (Volume publication date January 2013) First published online as a Review in Advance on September 27, 2012 DOI: 10.1146/annurev-psych-113011-143750

² McLellan, R., Galton, M., Steward, S. and Page, C. (2012). *The Impact of Creative Partnerships on the Wellbeing of Children and Young People*. Newcastle: CCE, <http://www.creativitycultureeducation.org/the-impact-of-creative-partnerships-on-the-wellbeing-of-children-and-young-people>

³ Thomson, P., Hall, C., Jones, K. and Sefton-Green, J. (2012). *The Signature Pedagogies Project: Final Report*. Newcastle: CCE, <http://www.creativitycultureeducation.org/the-signature-pedagogies-project>

Hypothesis: The students who participate in the AoL - intervention will develop their EF to a greater extent than the students who do not participate (control group). We also expect that students with the lowest academic achievement will have greater development of EF than their fellow students.

1.2 Executive Functions

In order to understand how art and culture can contribute to the development of the brain, one must first understand what the EF are. Self-regulation is a common simplification of the term EF. EF refers to neurocognitive abilities and subprocesses necessary for meaningful and targeted behaviour⁴. Executive functions consist of several elements that work together:

- Logical thinking
- Problem solving
- The ability to make choices
- Exercise of self-control
- Respond flexibly to changes in needs or in the environment
- Planning.

EF is essential for, and strongly associated with, both academic achievement and “school readiness”⁵.

EF are a collective term for the control functions in the brain needed to concentrate and think when acting impulsively is not appropriate. One can look at the EF as what makes us manage to regulate our behaviour on our own⁶, and difficulties with the EF can affect how one masters school life, social functioning, cognitive and psychological development⁷. EF is important for understanding how children face challenges at different levels of development.

There are many different conceptualizations of the concept of EF depending on whether one is studying it from a biological, neuropsychological or developmental psychological point of view. And there is an ongoing discussion about which cognitive functions are constituting the EF.

A central theory is the so-called "unity / diversity" model⁸. In this model, there are three cognitive components that make up the EF, inhibition (ability to resist interference and own impulses), working memory (active maintenance and manipulation of information within a given time span) and cognitive flexibility (ability to adapt to changing situations that requires different ways of thinking and actions). These three basic EF provide the basis for more complex EF such as reasoning, planning and problem solving.

⁴ Zelazo, P. D. & Müller, U. (2010). *Executive Function in Typical and Atypical Development*.

⁵ Alloway, T. P. & Alloway, R. G. (2010). Investigating the Predictive Roles of Working Memory and IQ in Academic Attainment. *Journal of Experimental Child Psychology*, 106(1), 20-29. <https://doi.org/10.1016/j.jecp.2009.11.003>

⁶ Barkley, R. A. (1997). Behavioral inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD. *Psychological Bulletin*, 121(1), 65-94. doi:10.1037/0033-2909.121.1.65

⁷ Diamond, A. (2013). *Want to Optimize Executive Functions and Academic Outcomes? Simple, Just Nourish the Human Spirit*. Hoboken, NJ, USA: Hoboken, NJ, USA: John Wiley & Sons, Inc.

⁸ Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A. & Wager, T. D. (2000). The Unity and Diversity of Executive Functions and Their Contributions to Complex "Frontal Lobe" Tasks: A Latent Variable Analysis. *Cognitive Psychology*, 41(1), 49-100. <https://doi.org/10.1006/cogp.1999.0734>

An overview of EF and its related terms are presented in Figure 1 below.

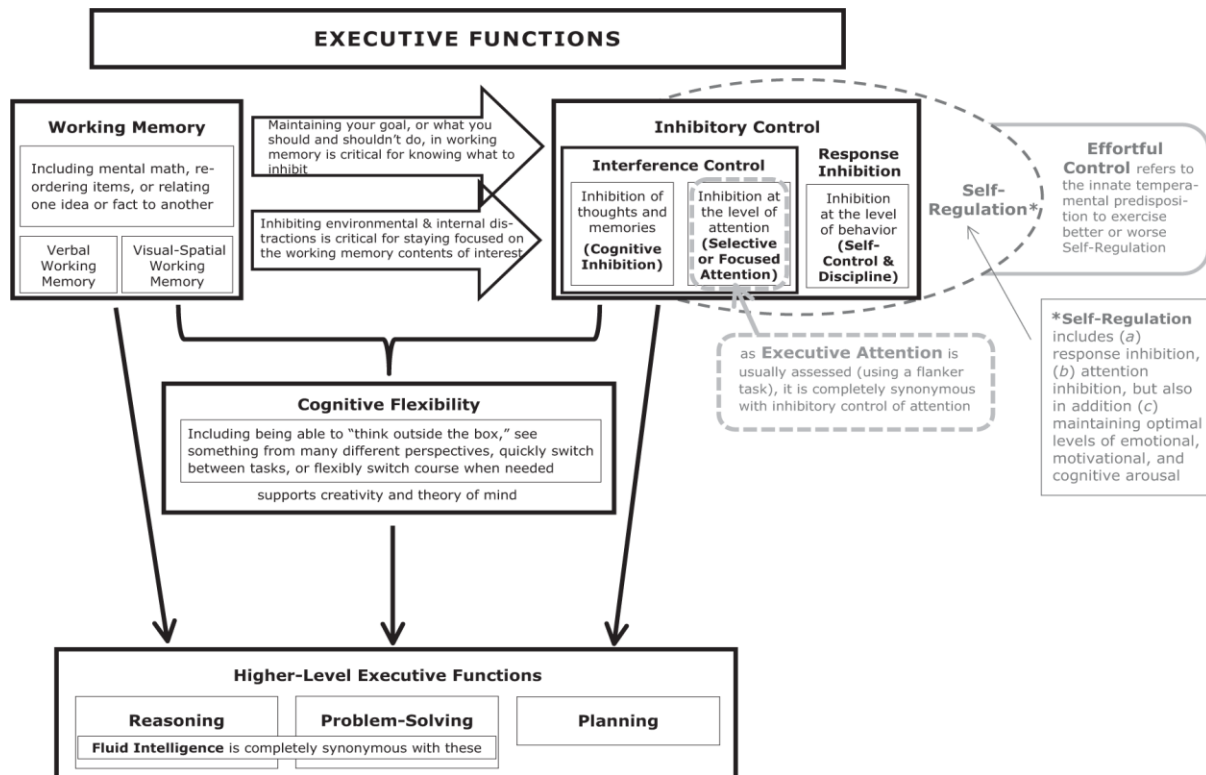


Figure 1: Diamond A. 2013. *Annu.Rev.Psychol.* 64: 135 - 68

In recent years, there has been an increased focus on various programs aimed at improving the EF. Researchers Mackey, Park, Robinson and Gabrieli (2017) investigated whether training students' work memory, inhibition and planning could improve their school results. They found that cognitive training improved the results of the students in the intervention group. Several interventions and activities have proven to have improved the EF. Examples of these are some computer-controlled training programs, interactive programs, some physical activities and a few special curricula, including the Montessori pedagogy⁹.

According to Diamond¹⁰, there are five common features for the programs that can improve the EF:

1. The children who have the most challenges with EF get the most out of the programs. In addition, early training will reduce deviations and decrease differences.
2. The transfer value from the programs to other areas of life is best where you work purposefully on all the EF in parallel. The transfer value from digital memory tasks and argumentation training is small, while the transmission effect is greater from practical task shift exercises, traditional martial arts and e.g. Montessori pedagogy.
3. The most demanding EF tasks give the best effect.
4. When the tasks are within the proximal development zone: the challenges must be increased in difficulty, otherwise they become boring. It is by pushing boundaries that one improves.

⁹ Diamond, A. (2013). *Want to Optimize Executive Functions and Academic Outcomes? Simple, Just Nourish the Human Spirit*. Hoboken, NJ, USA: Hoboken, NJ, USA: John Wiley & Sons, Inc.

¹⁰

school). At all the schools classes 1 and 2 participated in the research pilot, except for Dombås School which, due to low number of pupils participated with classes 1,2 and 3.

The artists who were to carry out the activities during the 12 week long pilot were selected. They were selected based on a want for experience from previous, similar activities in schools, as well as artists who have been trained and engaged in previous Creative Partnership projects in Oppland county. Four out of five artists were found this way. One last artist was chosen on recommendation of the art curators in the Cultural Rucksack, Oppland. The artists who carried out the activities with the pupils in the pilot were Rose Marie Aker, Hedda Roterud Amundsen, Svend Erichsen, Christine Mowinckel and Carol Kvande.

From CCE we were sent all 36 sessions applied to the Scotland 2017 AOL reseach project, as well as 12 newly developed sessions. Each session contained activities lasting a total of 60 minutes. We translated and adapted the sessions into Norwegian context and curriculum, as well as adjusting them to suit a younger target groups (from age range 7–9 in Scotland to age range 6–8 years in Norway). This work was carried out by Project Leader Marie Othilie Hundevadt, with support and input from artists who were to work in the project. A selection of these sessions is attached.

The digital test Yellow / Red was translated into Norwegian and adapted to the age group 6–8 years in consultation between INN and CEDETI.

Testing procedure as it was conducted in Scotland was handed over from CCE to INN and the test assistant (master student) who was to carry out the tests in the research pilot. 12 identical tablets were purchased to give equal conditions during the testing.

Implementation

The first step was testing a representative sample of students from each class and school prior to the intervention. The teachers completed the Behaviour Rating Inventory of Executive Function - Teacher Edition (BRIEF) for the students in the selection, and the same students completed the digital test Yellow / Red, led by a test assistant.

Second step was the intervention itself. This step involved a large upheaval of everyday life for the classes in the intervention group, while for the control group it meant having teaching as normal. In the intervention group, artists came to school and conducted predetermined arts activities with the students in sessions of 60 minutes: Tuesday, Wednesday and Thursday each week for 12 weeks (see figure 2). The teachers were present in all sessions. Every Friday, the teachers themselves should complete a 60-minute session with the students, based on the previous sessions of the same week. The students received a total of 240 minutes of arts activities each week, through 12 weeks.

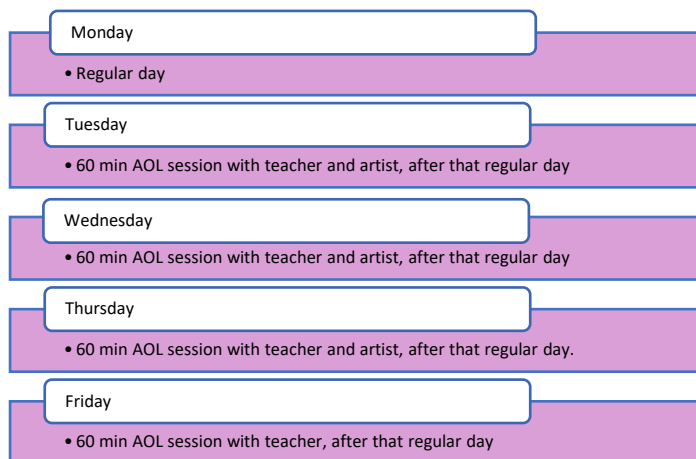


Figure 2: The school week during AOL intervention

The third step in the implementation was the second round of testing. The testing took place shortly after the actual intervention was over, and it happened parallel within the control schools and intervention schools. Here the tests were carried out in the same way as in the first step, both BRIEF and Yellow / Red were carried out in the same way, and with the same selection of students as in the first step.

In the same time frame as step 3, a qualitative study was carried out with the teachers at the intervention schools. Focus group interviews were conducted with the participating teachers at all the intervention schools, as well as individual interviews with one teacher at each school. The interviews were partly structured, meaning that the questions and topics were pre-arranged, but with room and opportunity for hearing the interviewees' experiences, as well as time for follow-up questions along the way. 1.5 hours was scheduled per group interview and 1 hour per individual interview.

The fourth and final step in the implementation was a third round of testing. The testing took place quite a while after the intervention was over, after a long summer holiday and just before the autumn holiday, in September 2018. The tests were also carried out in the same way as in the first and second steps, with both BRIEF and Yellow / Red as tools.

Follow-up

After the research pilot's four steps were completed, the data material from both interviews and testing was collected and analysed. The main responsibility for this work has been with Associate Professor Per Normann Andersen at INN, together with Master student Marita E. Klausen. The results of the analysis are presented in this report.

2.2 Contents of the intervention - the arts activities

The content of the intervention that was carried out consisted of a selection of predetermined art activities, translated and adapted after being passed on from the corresponding research project in Scotland in 2017.

The sessions were structured to ensure that the students worked with all 6 art forms: Music, theatre, dance, literature, visual art and photo / film (also called digital art). Six sessions / two weeks were devoted to each of the six art forms.

The sessions were all structured in the same way: Warm-up, Main activity and Reflection. Each session plan provided information about time frames, setup of rooms and instructions on how to conduct the activities, as well as practical needs and goals of each session and activity (see examples attached).

Each week, artists and teachers conducted three sessions, each with a total of 60 minutes, with the students. It was up to the artist and the teachers to adapt the sessions to the student group and the conditions they were working within. All changes from the original plans were recorded by the artist after each session and have since been filed in the project database. With regular sessions and registration of changes, we can, with as much certainty as possible, say what was done and how every activity through the 12-week long intervention were carried out.

The fourth session each week was open and was conducted by the teachers themselves. Here the teachers were free to decide which exercises from the week they wanted the students to work more with, to continue something they might not have finished with, to repeat something that was exciting or difficult, or to create new exercises. The artists could assist in planning this 4th session, supporting by bringing ideas for content and framework to the table.

2.3 Practical framework

The five artists were placed at the various intervention schools based on several criterias: 1) A wish for continuity: That the artists should become acquainted with the students and the teachers and vice versa 2) Which art form(s) the artist could work with 3) Practical considerations such as accessibility, driver's license and residence. The dispersion is shown in figure 3.

FASE	UKE	SKRINNHAGEN	SOLVANG	FÅVANG	STARTER	SLUTTER
UKE 1	5	Rose- Visuell	Christine - Drama	Hedda - Visuell	30.01.2018	02.02.2018
UKE 2	6	Rose. - Visuell	Christine - Drama	Hedda - Visuell	06.02.2018	09.02.2018
UKE 3	7	Rose - Litteratur	Christine - Musikk	Hedda - Digital	13.02.2018	16.02.2018
UKE 4	8	Rose - Litteratur	Carol - Musikk	Hedda - Digital	20.02.2018	23.02.2018
FERIE	9	VINTERFERIE			24.02.2018	04.03.2018
UKE 5	10	Hedda - digital	Christine - Dans	Svend - litteratur	06.03.2018	09.03.2018
UKE 6	11	Rose - Digital	Christine - Dans	Svend - Litteratur	13.03.2018	16.03.2018
UKE 7	12	Carol - Musikk	Svend - digital	Rose - Drama	20.03.2018	23.03.2018

Figure 3: Schedule AoL intervention

The artists conducted two sessions every day at the school they were based, one session in grade 1 and one session in grade 2. Common planning time for the artist and teachers were planned for at least once a week. How the days were organized within this frame, and when time was allocated for planning varied from school to school.

The schools were given all the materials they needed for conducting the activities in the intervention period, except for materials they already had easy access to at each school. Furthermore, the artists were responsible for ensuring that all relevant materials were ready before each session, and for preparing it.

Follow-up: During the intervention, the Project Leader visited all the schools, observed, took part in sessions, and had conversations with teachers and the artists. The extent to which this took place was dependent on the extent to which it was needed. The number of visits at the individual school varied between one and five visits. In addition to the Project Leader, Paul Collard and Diane Fisher-Naylor from CCE visited the schools during the intervention, and Marita E. Klausen, master's student at INN, were observing the activities one day in one school, prior to the interviews with the teachers. The Project Leader was also available by phone for everyone involved, and she had regular contact with all the artists, as needed.

Training and Evaluation: The school leaders and teachers at the intervention schools, as well as the artists, received training before the intervention began. This was to ensure that they all understood the content, the practicalities and the commitment in being part of AOL. The artists had three days of training, the school's staff had one day. The training courses were held by the Project Leader, with support from head of research in the pilot, Per Normann Andersen at INN. It is worth mentioning that the staff at the control schools were not trained, to avoid them being coloured or inspired to work different than normal during the period of the intervention.

After the intervention, school leaders, teachers and artists were once again gathered for a day's evaluation session. This was held by Paul Collard from CCE, assisted by one of the artists, and practically facilitated by the Project Leader's substitute (The Project Leader had at this time gone onto maternity leave). Master student Marita E. Klausen from INN was also present in this session.

3. METHOD

The intervention started in January 2018. As the research design suggests, data has been obtained in January, May and September 2018.

The data material is based on BRIEF questionnaires answered by the teachers and on qualitative interviews with the teachers who have been involved in the AoL. Additionally it was planned to use data from Yellow / Red testing of the students, but this data is not ready yet due to technical difficulties.

Approximately 220 students aged 6–8 at five different schools have been connected to the project. Of these, approximately 130 pupils have been part of the intervention, while the rest of the students have been in control schools. AoL contains standardized material with a variety of tasks designed to train EF, specifically work memory, inhibition and cognitive flexibility. The implementation of AoL in the intervention classes was carried out by artists and teachers in collaboration. These artists and teachers have received training by CCE and the Project Leader before the intervention took place. During the implementation period, they have received guidance from the Project Leader. A selection of students were tested through BRIEF and Yellow/Red at three stages in the process: Before, after

and six months after the intervention. The selection was determined by randomisation, 89 pupils from the intervention schools and 60 pupils from the control schools (see figure 4). Teacher interviews were conducted after the intervention, in May 2018. The purpose of these interviews was to collect data from the teachers' experiences of the AoL.

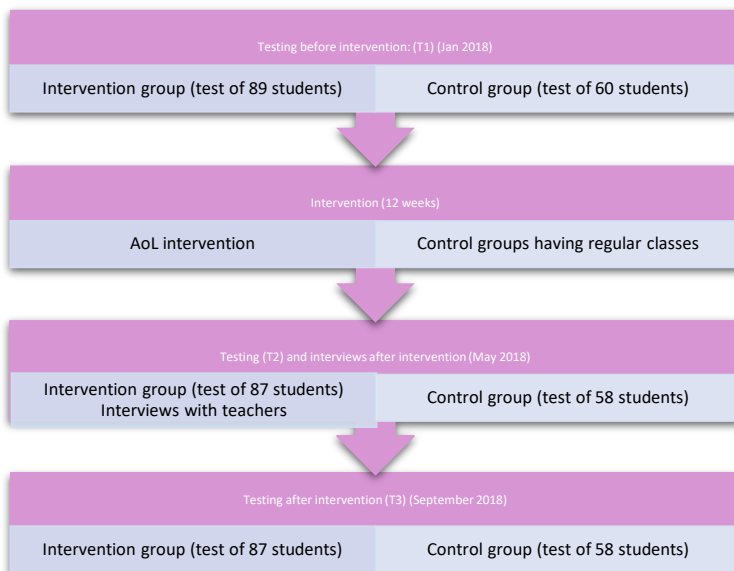


Figure 4

3.1 Qualitative interviews

"Interviews are a particularly suitable way to provide information on how people experienced and understood themselves and their surroundings"¹¹ In this research study, there was a desire to gain a deep understanding of how teachers experienced the AoL. How was it to be a teacher in the project? What did they experience happened to their students? Did they notice any changes after the project? With this as the aim, qualitative interviews was a natural choice of method.

The interviews conducted were semi structured, This means that the questions and topics are pre-arranged, but with space for the interviewees' experiences as well as follow-up questions along the way. This structure makes it possible to compare the answers from different schools, while still gaining insight in the actual experiences the teachers have had.

At each intervention school a focus group interview, as well as an individual interview with one teacher were conducted. Both individual interviews and focus group interviews are well suited for both developing new knowledge about a phenomenon and to bring out individual experiences with an intervention such as the AoL. 1,5 hour was dedicated for each group interview, and 1 hour to each individual interview.

Teachers who had been active through the whole intervention period was chosen for the individual interviews. The principle helped identify the candidates. In one school the selection was purely

¹¹ Thagaard, T. (2009). *Systematikk og innlevelse : en innføring i kvalitativ metode* (3. utg. utg.). Bergen: Fagbokforl.

based on teachers availability, as only one of the teachers in the project was available at the given time.

3.2 Quantitative surveys

Inclusion criteria: Children between 6 and 8 years, both sexes. All ethnic groups. Exclusion criteria for all participants: Children with learning disabilities or special educational needs.

Test Tools: Behaviour Rating Inventory of Executive Function (BRIEF) -teacher version for children and adolescents between 5 and 18 years of age is used. BRIEF is an 86-point well-validated and widely used questionnaire for completion by teachers and parents. It measures the EF by evaluating the child's behaviour in their natural environment, i.e. at home and at school.

Procedure: Information about the project was given in parent meetings at the school and to the students in the classroom. The parents had to sign a consent form to enable us to collect data on the pupils' EF. An ID number was given to all participants in order to be able to anonymize the data. The link between the ID number and the name was kept in a locked filing cabinet at INN and has not been available to anyone other than the researchers. All raw data from both questionnaires and tasks has been stored on a secure server at INN.

3.3 Analysis of qualitative data

In choosing an analysis, Kvale et al. (2015)¹² large amounts of material must be processed, and one can do this in different ways. In this research, a phenomenological research design and a hermeneutic approach have been used. In the analysis, it has been divided into categories that emerged in the process, as well as from interpretation of the data material.

All the interviews were recorded using a telephone recorder before being transferred to a PC with anonymous titles. After all the interviews were completed, they were structured for analysis by transcribing. The teachers, the schools and the artists became anonymous in the enrolment. All student names were erased. In total, the transcription make up 130 pages of written dialogue. This amount of data provides a good basis for interpretations.

The computer program QDA Miner Lite was used for coding and categorization. In this process, several meaningful categories were extracted, and a selection of these were included in this report. The categories are related to statements made by the interviewees about the phenomena they experienced during and after the AoL intervention. The material was read and reviewed several times and a summary of the most important, meaningful statements can be read here.

3.4 Analysis of quantitative data

Demographic characteristics were studied using chi-square and independent samples T-test analysis. The possible interaction effect between EF development over time and group affiliation was studied using analysis of variance (ANOVA). SPSS version 24 was used for the analysis.

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3.5 Ethics

The project is approved by the Norwegian Centre for Research Data (NSD). All data is anonymized. The participants received clear information that the project had the status of research. This was stated in information provided at the school and in parental meetings. Signed consent forms from the parents has been mandatory.



4. RESULTS

4.1 Results from qualitative study: Interview with the teachers

The experience of the AoL shared by the teachers at the various intervention schools, spans from a feeling that the AoL has been difficult and labour-intensive, to a feeling that being chosen for the AoL was "like winning the lottery". The teachers have also experienced great variation in level of support from their school leaders, from being almost absent to be giving all needed assistance and support. Consequently, the working conditions in which the teachers have implemented the AoL have been very different in the three intervention schools.

Despite major differences in working conditions and feelings for the project, all intervention schools report similar effects from the project. All the schools report positive effects on pupils in relation to collaboration, conflict management, inclusion, vocabulary, safety and self-confidence. Additionally, all the schools also report that when it first started, it all started with chaos.

Starting with chaos: In the teachers interviews all three schools report that when the AoL started, it started with noise and chaos. Some described that restless students got more demanding, and others that individual students hid behind curtains or under chairs to avoid being involved, and one teacher described herself initially as a "gate keeper". In all three schools, it took time before students understood the program and accepted that everyday life now was different from what they

were used to. However, in all the schools, the teachers described that the chaos cooled down after a while.

Collaboration: The teachers from all three schools describe that the project gave the students new tools to succeed in collaboration with others. In the program the students had to discuss solutions, give and take, individualists had to open up to others' views and ideas, and no one could just run their own race, so to speak. Schools explained that their students have learned to cooperate with others, not just with their best friend, and one teacher explains how this changed the whole classroom dynamic, and thus created a better school environment.

Managing conflicts: The schools all report that the students has improved in managing, avoiding and solving conflicts. One school reports that both pupils and teachers have a new approach to conflicts, both because the pupils have new language and tools to resolve things on their own, and because the teachers have gained confidence in giving the responsibility for solving conflicts to the students, inviting them to talk it through with each other. This has led to fewer conflicts and pupils that more often are solving conflicts themselves. Another school tells of great generosity amongst the students in the group, that the students accept each other in a new way, and that no one is laughing at each other. One teacher from this school tells about an episode where students who have had some conflicts in the past, gets a collaborative task that asks them to deal with a bullying situation. The teacher observes that they work well together and have conversations about how the situation can best be resolved.

"... to think that they are sitting now, talking about how to deal with [a bullying situation] like that ... And you know that there's been some situations between those [in the group] in the past, right. So, that was very touching to see. "

The third school also see that their pupils have improved on conflict management, but at the same time they say this is something they have focused on throughout the year, so the teachers are uncertain whether it is the AoL project that has led to this improvement.

Inclusion: In the interviews, two of the schools are eager to tell the effect the project has had on inclusion. One school describes how the pupils, through collaborating with several, not just the best friends, create a better school environment. They see that students who previously were left outside now are included, and that everyone is included in a different way than before. At the other school, they report much of the same effect. From a situation where the pupils stuck to their one close friend or one fixed group they are now much more flexible:

"To create groups - everything like that - it's like no protests anymore. And this has a great impact on each kid – they no longer need to feel left out [...]. No longer [negative] comments like "I don't want to work with you". That certainly does good for the class environment."

The teachers explains how this has spread also outside school, so more pupils are not getting invites to visit their school mates after school and in weekends. More children visit each other's homes. Thus, the inclusion takes place both in the classroom, in the social play of leisure time and at home. The established groups are dissolved, and the students has expanded their circle of friends. At the last school, the teachers have not named inclusion as a topic, but they describe, among other things, how they feel that the pupils have become more patient with each other through the project, without linking this to the subject of inclusion.

Vocabulary: All three schools report that the pupils have expanded their vocabulary. They describe, respectively, how the students have acquired a richer language, learned new concepts and / or have

become better at reflecting. Students have, through the process, learned to explain to each other, talk to each other, listen to each other's opinions, and manages to use their language to communicate better, teachers say. One teacher describes how the pupils gained a larger conceptual understanding which also led to them being able to find words to describe how they experienced the sessions. That pupils who initially just didn't want to be involved, after a while was able to put into words what was difficult to handle, and suggest how they could overcome the problem. Sometimes the solution was to observe for a while, which the program design always accepted. And often they threw themselves into the tasks again shortly after. One teacher also mentions that, more often, as the project progressed, she could have "proper conversations" with her students. From another school, teachers describe how conversations with students could now be longer, that students actually listened to each other's opinions, and that they were able to build on to thoughts or ideas that others had started. Another teacher describes how students no longer just says "no," but instead elaborates on why they say no, and explains what they mean.

Safety and self-confidence: All schools describe that students now are feeling safer. The project has created safer students, and they are safer in showing what they stand for and in showing their work to each other. All three schools report that this change has happened. One school has an example of a student who has clearly become safer. They explain: A mature, capable student who was "brilliant at reading and everything". But who has never been willing to speak in the classroom, neither with the teachers, and who was completely closed. This worried her mother so much that she considered sending her daughter to a psychologist. But then:

"During the AoL, gradually she started raising her hand, wishing to speak. And now, in the classroom – she raises her hand all the time. And she speaks. And we can even hear her voice. I think her mother can cancel the psychologist! "

Through the project, the students have shared with others, everyone has shown things they have worked on before the whole class, and they have had to stand by their choices and argue for their opinions. Teachers from all schools believe this has left their students feeling empowered, they have increased their self-confidence or soundness. One teacher describes how students who initially always followed the strong one in the group, having the exact same opinions as this strong one, eventually made their own opinions and stood up for them. Others described how in the beginning there were several students who would only observe, but in turn they too wanted to show their work to the rest of the group.

Whether it is named as feeling safer, empowerment, thriving or gaining self-confidence, it is apparent that in all three schools are experiencing a similar effect like this on their students.

In addition to these main findings common to all three schools, individual schools have reported other results from the AoL. For instance some teachers feel that being a teacher in their class has become easier. This and other findings have not been included in this report, but they can be found in Marita E. Klausen's Master's thesis «*Art of learning*»: *Can artbased training of executive functions increase students social skills?*.¹³

¹³ Klausen, M.E. (2019). «Art of learning»: Can artbased training of executive functions increase students social skills? Innlandet University College of Applied Sciences.

4.2 Results from the quantitative survey - BRIEF

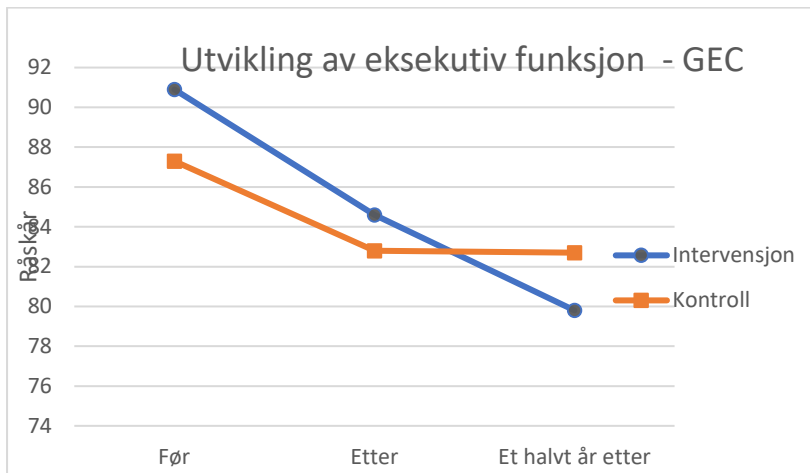


Figure 4: GEC

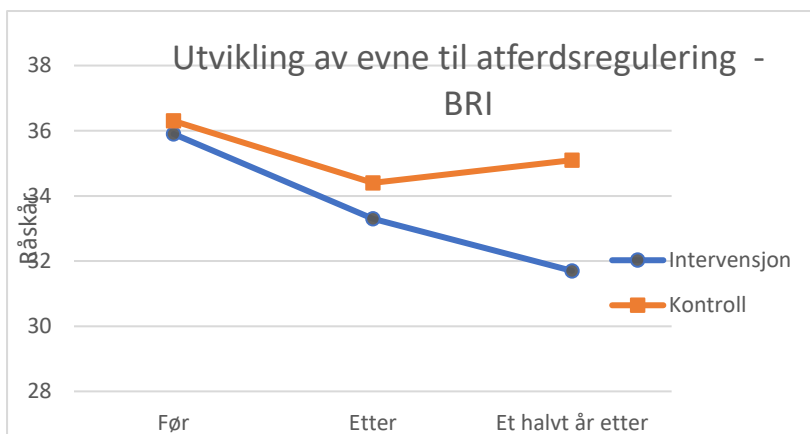


Figure 5: BRI

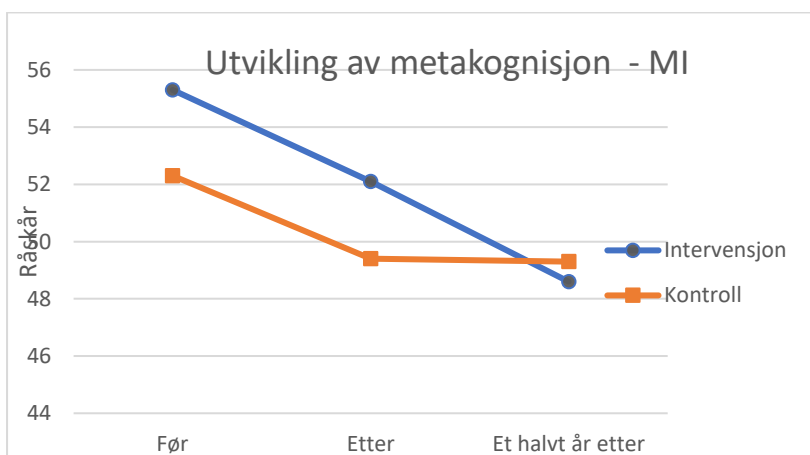


Figure 6: MI

The teachers at both the intervention schools and the control schools have completed the Behaviour Rating Inventory of Executive Function - Teacher Edition (BRIEF) for the students three times. T1 in January 2018 (before the start of the intervention), T2 in May 2018 (shortly after the end of the intervention) and T3 in September 2018 (after a long summer holiday, before the autumn holiday). BRIEF is a reporting form that is used to measure the ability of functional self-regulation / EF in

everyday situations. The scores from the form are grouped into different scales (inhibition, emotional control, working memory, cognitive flexibility, initiative, planning / organization, organization of material and monitoring). These are summed up in a Behavioural Regulation Index; BRI) and a metacognition index (MI), these two are summed up in overall EF score (Global Executive Composite; GEC). In the graphs on the next page, the intervention group's score is coloured blue, while the control group's score is coloured orange. It is also useful to note that lower scores represents better EF.

Overall: The results of these surveys show that the intervention group had significantly ($p = <.05$) better development of its EF than the control group. We see this both on the overall score for EF (GEC, figure 4), and on the scale for behavioural regulation (BRI, figure 5). There is also a trend towards a greater degree of improved metacognition (MI, Figure 6) in the intervention group than in the control group over time, but the difference here is not significant. Despite significant differences between groups over time, the difference in points is not very large. It is thus not given that there is a correspondingly small difference between the groups in EF in everyday life as the teachers see it, as a small improvement in scores can represent a substantial difference in function.

So how can one explain this prolonged improvement after the intervention? As a hypothesis, one can imagine that there is a learning effect from the intervention, which the pupils bring with them into the next school year - a further improvement of the EF over time, underpinned by maturation. We saw a trend for this development at T2, but it was only at T3 that the differences in development in the groups over time became significant.

There is also a possibility that the teachers involved in the intervention gradually altered their pedagogical practices to be more in accordance with AOL, so the prolonged effect may be directly related to the intervention. Such learning gains for teachers has also been reported from previous evaluations of other creative, arts and culture rich school curricula (Thomson, 2015)¹⁴

Results quantitative survey - Yellow / Red

Due to problems with data coding, the results of this test are not yet ready, and it is not certain when / if these will come in place.

4.3 Compilation of qualitative and quantitative results

The hypothesis of the research has been:

The students participating in the AoL - intervention will develop their EF to a greater extent than the non-participating students (control group). We also expect that students with the lowest academic achievement will have greater development of EF than their fellow students.

The first part of the hypothesis for the research states that the students at the intervention schools will develop the EF more than the control schools.

¹⁴ Thomson, P., Coles, R., Hallewell, M., & Keane, J. (2015). A critical review of the Creative Partnerships archive: How was cultural value understood, researched and evidenced? Retrieved from Creativity, Culture & Education website: <https://www.creativitycultureeducation.org/publication/a-critical-review-of-the-creative-partnerships-archive/>

From the BRIEF results we can read that the students at the intervention schools have developed their EF to a greater extent than the pupils at the control schools during the same period. How does this picture look when we insert the results from the qualitative results?

There is consensus among the teachers around some positive effects of the AoL intervention: Both in relation to cooperation, conflict management, inclusion, vocabulary, safety and self-confidence. The teachers report lower levels of conflicts and students who more than before intervene to solve problems themselves. Instead of students acting or speaking impulsively and ending up saying or doing things they might regret, they now take extra time to think, and they avoid conflicts, or it more rarely escalates. This suggests that students have improved their inhibition, namely their ability to not act on their first impulse, but rather think twice.

Inhibition is also about the ability to ignore disturbances, and thus the ability to improve focus and concentration. When teachers report that students now can sit and concentrate for a long time, that they can have longer conversations with their pupils where they follow the line of thought and can take turns to talk, as well as settling in the classroom more quickly, one can easily connect this to an increased level of inhibition.

The same is to say about students who, only a few weeks into the intervention, are able to keep focus at what the artist is saying, even with tempting climbing walls in eye sight constantly. The teachers describe that pupils are better at collaborative tasks, and works well in different groups. They describe how students can accept the group decision, even when they had other ideas themselves. One teacher said: "And now everybody knows that the stupidest thing to say is "I want to decide!" Now everybody know that means you've missed the point!" These examples describes children who are resisting temptations of climbing walls or running a solo race, because they realise that a common result a little further ahead is preferable. That again means they are actively using and developing their inhibition.

Another approach teachers' report on is the so-called "individualists" who, after the intervention, have gained a stronger ability to open up to others views and ideas, which may relate to improvements in the pupils' cognitive flexibility. Cognitive flexibility is about seeing things from different perspectives, from someone else's perspective, and being able to adapt to different scenarios or other actions than your initial idea. Changing the environment, changing groups and changing between tasks requires good cognitive flexibility. This too is something the teachers report, namely that transitions are easier, they settle faster, and switching from one room to another, from one group to another, has worked better after the AoL.

According to the teachers, the pupils have grown a richer language with new concepts, and the teachers can now have proper conversations with the students in the classroom. We can see this as an improvement of working memory. To be able to translate what someone says into action, to assess different options and consider your choices, or to play with an idea in your mind while listening to others input – these abilities all requires working memory. When the teachers report that, the students are listening better to each other, can keep track through longer conversations and have a better understanding of collaborative tasks it seems vivid that the working memory of the students has grown.

Children need to think creatively to find solutions that are not thought of before. They need working memory to work with large amounts of data and see new links. They need flexibility to appreciate

different perspectives and exploit the coincidences. And they need self-control to avoid temptations and to not do things they will regret.¹⁵

Results from the BRIEF questionnaire and results from the teacher interviews is highly consistent and several of the positive changes the teachers have noticed can be read as an expression of improved EF.



4. ASSESSMENT OF RESULTS

In order to assess the validity of the results from the survey, it is important to look at features that may have affected the results, and here we will deduce both elements that may have weakened the results and elements that may strengthen the results.

Adjustments to the target group: Some of the activities were too difficult for the target group, especially for the students in year 1, 6-7 years old. Specifically was this true regarding the level of abstraction, the explanation language and the time frames set for each activity. This is feedback that comes from both teachers and artists. As a consequence, the facilitators had to spend extra time explaining words, concepts and expressions, thus giving the students less time to carry out the tasks than intended. Some sessions also ended before the last part, the reflection section was completed, for this reason.

Dialogue with school leaders: A closer dialogue with the school leaders, for opening up the teachers' schedule and for recognition of the work the teachers do in the program, will be essential and must be remedied in a possible continuation of this study. We see that the leader's involvement and facilitation are clearly reflected in the teachers' experiences of being part of the AoL. The teachers who experienced good support and adaptation had the best experience with the participation, while the teachers who lacked this support had a less positive experience. Feedback during evaluation interviews suggests that the teachers' experience of ownership of the project depends on the school

¹⁵ Diamond, A. & Lee, K. (2011). Interventions shown to aid executive function development in children 4 to 12 years old. *Science (New York, N.Y.)*, 333(6045), 959. <https://doi.org/10.1126/science.1204529>

leader's support. This bullet point must therefore stay as a backdrop during the reading of the following two bullet points.

Facilitation in the school: Several of the teachers experienced that the participation required a lot from them, work that was put on top of what is already a packed schedule. Because of this, the time used for planning and evaluating with the artists was inadequate. Furthermore, this led to some teachers skipping the 4th session of the week. This created a different number of hours with the AoL for the students at the different schools, and that is unfortunate for the research. As a long term result, it might grow more difficult to get participating schools and teachers in similar research if this continues to be true.

Lack of understanding of the intention: Some teachers chose to take out the weakest students in sessions where they felt that the students were not engaged, which is contrary to the intention of the intervention. This suggests that some teachers lacked in understanding of the project. This in turn indicates that the training program before the intervention was not well-enough organized, and will need improvement in a future similar research program. The training was perhaps too short (one day), and it probably happened too close to the intervention (the day before start-up). This issue also points to a different challenge - namely that specialist teachers and assistants who often spend a lot of time with individual students or in class – did not participate in preparatory training, nor have they taken part in the planning sessions during the intervention, and thus have not been given grounds to understand the intention behind the project.

Artist rotation: Since it takes time for teachers and students to develop a good relationship with the artist that comes into school from outside, it would be ideal for each school to only work with one or two artists during the period. Both teachers and artists agreed on this. The challenge is that the intervention framework is designed with six different art forms, and to both maintain high quality in the arts and at the same time avoid rotation is a huge challenge. One solution could be to carry out the intervention with only one or two of the six art forms at a time, or to lengthen the entire intervention to get more weeks of stability with each art form / artist in each school.

Increased adult density: A possible source of error is that the intervention schools through the AoL have been given extra adults as the artists are an addition to the school's own staff. This could have given the intervention classes better learning conditions, which in itself conceivably could affect the EF in a positive direction. The fact that the EFs has continued to increase even after the artists have left weakens this theory. To eliminate this source of error would require more research, for instance a larger study where one group received AoL program while a similar group received regular teaching with an extra adult, to clarify which is which.

Summarizing these points, it is vivid that the intervention was only a pilot, and that more thought and work must be given to build a stronger support system in a similar future research. Some of the weak points led to the intervention not being completed according to plan, and thus some students did not participate in all the sessions. One can therefore hypothetically imagine an even stronger trend in the development of the EF in the intervention group, given ideal conditions. The effect of increased adult density is difficult to measure but should be taken into account.

On the other hand, there are several elements that strengthens the results from this research pilot.

The number of participants was good. The number of participants in the research pilot is sufficient to detect systematic differences between the groups, although larger studies are desirable in order to increase the ability to generalise.

The schools that participated were equally interested in the project, and they all wanted to be intervention schools. The distribution between the schools that were intervention schools and control schools was done by lottery. This way, we can ignore the possibility that the results reflect an already established interest in this type of activity.

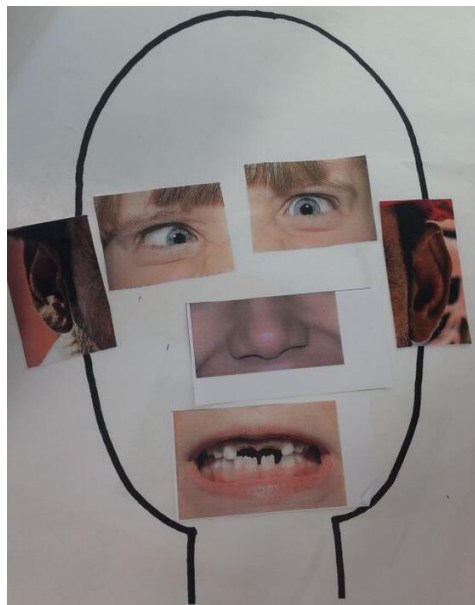
The intervention lasted quite a while, 12 weeks, which provides a good basis for data collection. That said, a longer intervention could provide an even better foundation. The sessions the students have gone through are the same at all the intervention schools. This allows us to know with certainty what exercises and activities the participating students have done, and makes the intervention, hence also the research program possible to repeat.

AoL interventions are also being carried out in other places internationally, in Scotland, Chile and Australia. The results from Scotland have been evaluated positively, the others are to date ongoing projects. This makes it possible to build this pilot into a larger context, and thus in future to be able to compare results across culture and borders.

The intervention has been evaluated both qualitatively and quantitatively, and the findings in both the qualitative and quantitative study support each other, which also strengthens the validity of the findings.

We have seen that the different schools have had quite different experiences from taking part in the AoL intervention. Some have appreciated it; others have "survived" it. Despite this, we have obtained results from all the intervention schools. This eliminates the possible error that positive attitude and enthusiasm has led to good results. That is not the case in this research, and that is an actual strength for the research results.

In summary, we see that a number of elements are strengthening the findings, and thanks to the fixed design a future comparison with similar studies abroad is possible, and might strengthen the results even more.



5. CONCLUSION

In this report, we have looked at how arts and culture-based activities may affect the EF of the students in year 1 and 2 in a selection of primary schools in Oppland County, Norway. Specifically, we wanted to investigate whether a 12-week diverse, arts-based learning program in school could have a positive effect on the pupils' development of their EF.

Our findings are:

- Through the BRIEF tests, we have found that the intervention group has had a significant ($p < .05$) better development of its EF than the control group over the same period.
- Despite differences in facilitation and framework in the different schools, we have still collected positive results from all the intervention schools.
- The positive changes the teachers see, largely correspond with the findings from the BRIEF testing.

All that said, this has been a research *pilot* meaning the sample has been relatively small, the time frames have been limited, and the adaptations and follow-up could have been more thorough. This AoL research pilot has given some positive findings, which indicates that this field of research certainly is worth examining more closely.



6. FINALLY – AN ARTISTIC CONSIDERATION

From an artistic perspective, it may seem unusual to have such a tight framework around an artistically founded program. This dilemma has been discussed between the artists through the work with the AoL research pilot. The reason for the rigid structure is to ensure that all the pupils participating get an almost equal experience, and with that to demonstrate almost exactly what led to the given results. On the other hand, there is no doubt that the creative, exploratory side of the arts is thus minimized. It is therefore important to specify that this research pilot does not indicate that one should change the school's art activities to conform to the template format of the sessions in this intervention. The structure has been a necessity to be able to work in an interdisciplinary way. And hopefully it will produce results that in turn can give the arts and cultural activities more space in school, with space for both long, broad, narrow and high activities!

ATTACHMENTS



2 Main activity

Uke 1 øvelse 3 – Spørsmålrammen



35'

Mål

Undersøke detaljer i et bilde, formulere spørsmål for å lære om kunstverket.

Kognitiv-prosess

Kognitiv fleksibilitet, fordi elevene skal forestille seg hva bildet handler om og deretter justere sine oppfatninger når de stiller spørsmål og samler mer informasjon om bildet. Dette krever også inhibisjon, særs når elevene vet hvordan bildet ser ut og de skal motstå fristelsen å avsløre informasjon om bildet til andre elever.

Fagplanmål

Skriftkultur: Lytte og snakke, finne og ta i bruk informasjon, forstå, analysere og evaluere.

materialer

- Utskrift som viser hele kunstverket (B) og utskrift av kun et utkast av kunstverket (A). Hver gruppe på rundt fem elever trenger både A og B av et kunstverk. Sett A og B inn i mappe med A på toppen og B under.
- Flippover der du har skrevet ned oppgaven.
- Kort til å skrive ned spørsmål. Hver gruppe kan stille to spørsmål.

oppsett

Romslig klasserom eller gymsal med plass til å jobbe i grupper inndelt på fem personer.



tips

- veiledning*
1. Nå skal vi dele inn i grupper på fem. Del elevene inn i grupper på fem. Kan vi få opp en frivillig fra hver gruppe som kommer opp her og får en hemmelig oppgave. [Sett inn navn på lærer eller kunstner] skal fortelle resten av klassen hva dere skal gjøre.
 2. Gruppen med frivillige går ut av rommet og får denne oppgaven: Jeg skal gi hver av dere en mappe som har to bilder - bilde A og bilde B. Kun du skal se på bilde B som er et helt bilde. Alle de andre i gruppen din skal bare se bilde A, som viser et utkast av bilde B. Forstår alle oppgaven? Gi de frivillige en mappe hver. Nå kan du se på bilde B. Se nøye på bildet og prøv å absorbere detaljene så godt som du kan. Når dere går tilbake skal du kun vise bilde A til gruppen din. Elevene som ble igjen i klasserommet skal prøve å finne ut hva hele bildet handler om, men de kan bare gjøre dette ved å stille spørsmål. Dere kan svare JA, NEI, eller si at dere ikke kan svare på spørsmålet. Hvis dere står fast, eller hvis dere ikke kan huske hele bildet, be om hjelp eller se raskt på bildet - men sørg for at gruppen ikke ser bildet. Gi de frivillige to minutter til å studere bilde B. Deretter gjør dere mappene klare slik at de kan gå tilbake og vise bilde A. La oss gå tilbake til gruppene våre og vise bilde A.
 3. Når de frivillige er ute av rommet, forklares oppgaven til resten av klassen. De frivillige ser på et bilde, og når de kommer tilbake viser de gruppen et utkast av bildet. Vis klassen et eksempel på bilde B og deretter bilde A, slik at



1 Warm Up

Week 2 Session 1 – Group Story With Cards



15'

Objectives

To come up with a story narrated one person at a time, sentence by sentence, while including words written on cards drawn blindly.

Cognitive process

Cognitive flexibility, because learners need to adjust their thinking to include different words in their sentences alongside finding original and meaningful ways of incorporating them to enhance the story. Working memory, because they need to recall and consider the story so far and make their contribution fit within it.

materials

- The cards with the words provided, printed and cut up in advance, one set per group.
- Possibly small non-transparent bags/pouches to keep the cards in, one per group.

set up

Large open space (eg hall) for work in groups of 6–9.



tips

instructions

1. Get learners to form groups of 6–9, making sure you have a set of cards for each group.
2. Explain that they will now have to come up with a short story as a group. Each person in the group will come up with a sentence and then the next person in the group will continue the story (go round the group clockwise). They will have 2 rounds (or 3, if the groups are small) to finish the story. The story can be about anything. (Alternatively, you could give them a topic being currently explored at school or give them several options, perhaps asking them to pick one from a hat. Make sure the words on the cards provided would fit the topics set by you.)
3. Ask learners what they think makes a story a good one (e.g. clear start, middle and end, good characters, something interesting happening, good adjectives, etc.). Next, ask learners what they might need to think about when it is their turn to contribute to the story (e.g. how their sentence fits with the story so far). Remind the groups that they are working as a team.
4. However, each group has a set of cards with words written on them. When it is a person's turn they have to pick a card from the top of the set, turn it over and use the word written on the card in their sentence. They keep their card and pass the set to the next person who will pick a card from the top and use it in their sentence, and so on. (Alternatively, they could pick a card from a little bag.)
5. Ask everyone if they understand and get a learner to explain what they think and explain if necessary. Pick a learner to begin and give them the set of cards, face down. Remind them that the story moves around clockwise and that it should go around the group twice (or three times if necessary) and who the person to finish the story will be.
6. If time allows or if some groups finish quickly, ask the groups to shuffle their cards and create a different story, this time in one round only.

reflection

- Ask learners whether they found coming up with a story like this hard. Did the cards help or make coming up with a sentence more difficult? Where there any really interesting sentences in their group? Why were they interesting? What made a sentence a good one? How did the groups work together? Were there tools that might have helped groups to work well together?



2 Main activity

Week 1 Session 3 – The Match Moves



40'

instructions

5. (continued) Let's share some of our moves. How do they compare to MOVE 1? What is different? Choose a strong piece from those that were shared. Let's look again at what this pair came up with. Ask the learners to make each move clear and prominent and to repeat. Let's practice that together. Give time. So this will be our MOVE 2.
6. And now let's see – can we all remember MOVE 1? Let's do that again. Wait for everyone to perform the move. Great, and let's see if we can put them together and try to connect MOVE 1 fluidly to MOVE 2. Remember that you are a spectator at the match, so keep that in your mind as you move. However, you're a dancer now as well, performing a short dance piece, putting the two moves together. Let's try that. As learners perform MOVE 1 and then MOVE 2, observe and identify pairs who create strong linking movements and share those. Choose one. Let's link our two moves in the same way as [X] and [Y] did. Give time for practice and to repeat.
7. Now let's think of third and final move – what else might happen in a game that the crowd could respond to? Give time for learners to share their ideas and choose one to work with, portraying a distinct situation or emotion. So how would you feel and react if this happened, how would you move? Think about your emotions – what would you feel, and how would you show it, with your arms, your whole body, posture, your head, face... You could face a different direction; the speed of movements could be different; it could be longer. Try to be adventurous. Give learners time to devise and practice, and again observe, comment and identify different pairs to share. This time we are not all going to do the same MOVE 3; we are going to keep the one we devised in our pair.
8. We now need to link all three moves together. Let's do MOVE 1 and MOVE 2 again. Give time for practice and to repeat. Now let's come up with a really strong linking movement and join in our MOVE 3. Give time for practice and to repeat.
9. And now we have a dance piece that has two movements which are the same, and our final movement will be different. Let's all practice – in your pair find a space to work in. I will play some music to inspire us. Allow the pairs to go through the moves one at a time.
10. How can we improve our work? Work with another pair: share your three moves and give each other advice on how you can make the piece better. I'll give you a few minutes to work on that, and then we will all share our pieces a few pairs at a time. After each pair shared with another one, put the pairs into small groups of around 8 and get each group to share their work.

tips



3 Reflection

Week 1 Session 3 – Questions



10'

Objectives

To reflect on improvements in our work and the reasons for it.

Cognitive process

Cognitive flexibility, because learners need to consider their work and how it improved and why.

instructions

1. So, let's get into our huddles again – for a team talk. Like in the warm-up, we should talk about what we got better at and why you think that happened. Allow the learners time to discuss their thoughts.
2. Let's hear back from each team huddle. The adults in the space should also share their thoughts on where they noticed real improvement. Thank the learners for their work.

materials

→ None.

set up

Large open space (eg hall) for work in small groups and a large circle.



tips