From the Outside In

At Orleans House Gallery

Evaluation

February 2017

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A Background

From the Outside In is a Wellcome Trust-funded project, bringing together art and science in the context of young people with learning difficulties and special educational needs. It is run by the Orleans House Gallery at Twickenham Riverside, London, which forms part of the Richmond Arts Service provided by the London Borough of Richmond-upon-Thames.

1 The project

From the Outside In is a collaboration between artists and scientists (and other content-experts), focussing on the gallery's evening art groups for people with additional needs and learning disabilities, Octagon Club (involving school-age children from 11-17) and Transitions Art Group (involving young people and adults from 18+). This was a rare occasion for both groups to be working on the same project.

Club sessions were run from 4.00 to 6.00pm once a week (for each club), and members were also involved in a number of off-site visits (Science Museum, the Wellcome Collection), and several dissemination events involving others involved in the arts and education, and the general public. The project has also run a series of outreach sessions with local teachers, and developed a resource pack for use in schools. The evaluation focuses mainly on the workshops and dissemination events, and does not distinguish between clubs, as inputs, outputs and outcomes were very similar.

Workshops took place over the spring and summer terms of 2016. The focus for each of the four modules was:

- Memory and Movement
- Genetics and Digital Technology
- The Mechanics of the Body
- Mapping the Body.

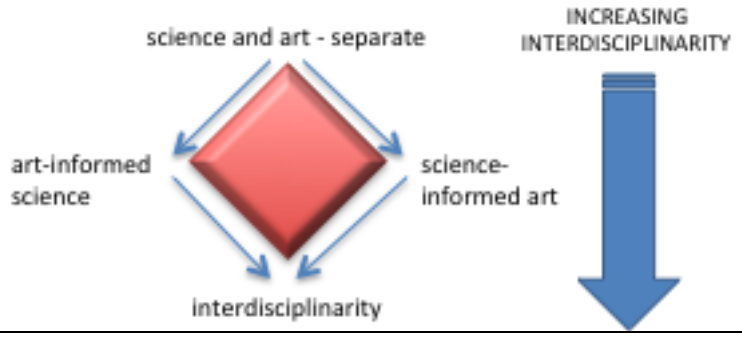
Each module was led by a practicing artist, and had input and advice from content experts (science communication and medical history), supported by gallery and support staff.

The project has also created a resource box. This was piloted in December 2016 with three schools including one for pupils with SEN. The pilot sessions used some of the project themes, including aspects of the science curriculum. Two artists were commissioned to create the box, which contains engaging objects for users to interact with. These resources are now being used along with the Arts Award Discover to underpin a day-long workshop including art and science in local schools.

2 Science and art

Projects involving science and art coming together (sometimes called *SciArt or art-science*) are a growing phenomenon in the UK (and beyond). Various models of art-science collaborations exist, as shown on the following page[1]:

Science-art interaction model



This project fits with the *science-informed art* sector of the diagram, as it is based on workshop sessions that begin with a significant science stimulus (sometimes representing cutting edge scientific research as well as more everyday contexts such as measuring our bodies) which then informs the subsequent art activities.

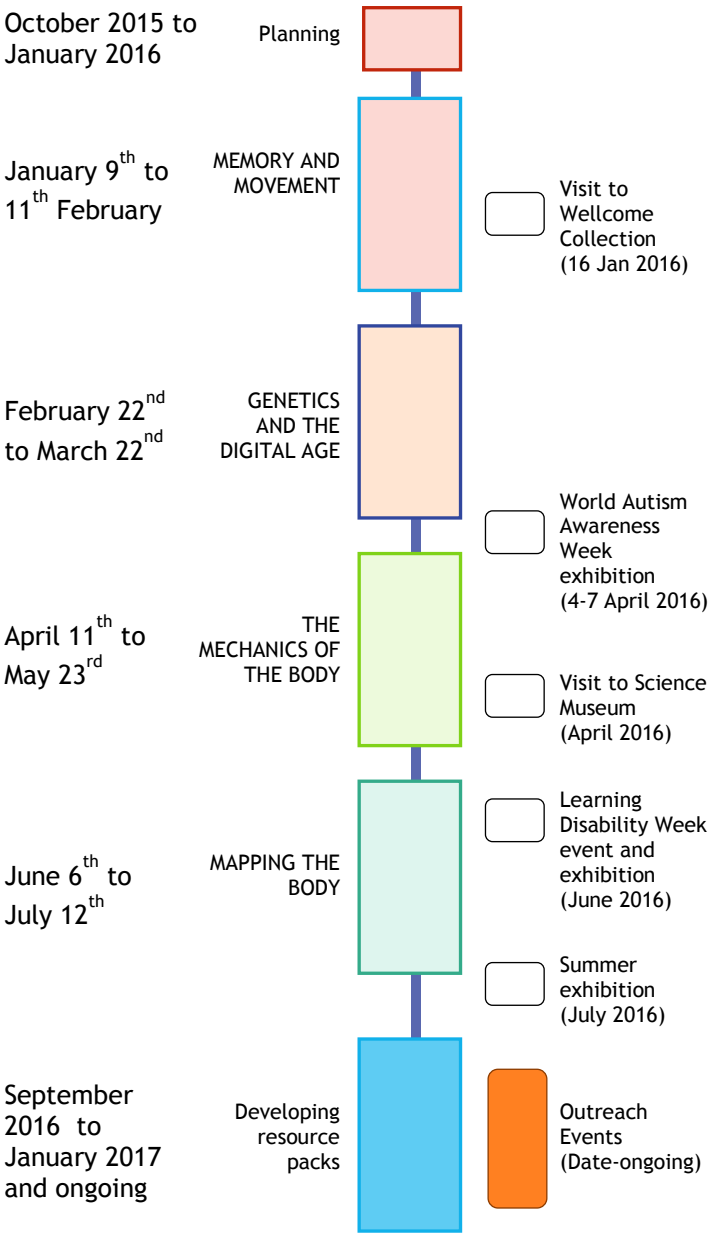
Muller's paper identifies art-science projects as inhabiting a 'third space', between the two cultures (CP Snow) of science, and of art. This third space is now a growing field of professional activity and research. The paper also talks about how the importance of measuring the value of art-science activity for artists, scientists and the audiences who engage with the work. This multi-beneficiary approach underpins this evaluation.

3 Project outputs and participation

Number of workshops	
Octagon Club	24
Transitions	24
Participation	
Octagon Club	10 SEN members
	5 volunteers
	4 staff
Transitions	12 SEN members
	4 volunteers
	5 carers
	4 staff
Museum visits	16 children
	13 adults
Exhibition	30 SEN
	70 adults
Outreach events	236 children
	63 adults

[1] Adapted from Muller et al., Understanding third space: evaluating art-science collaboration. Proceedings of the 21st International Symposium on Electronic Art, 2015

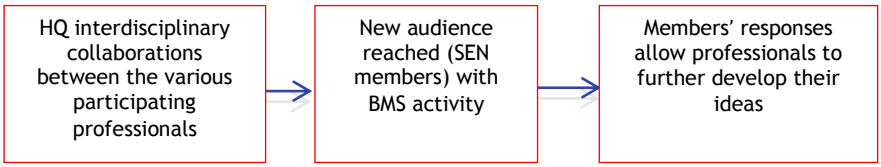
4 Project timeline



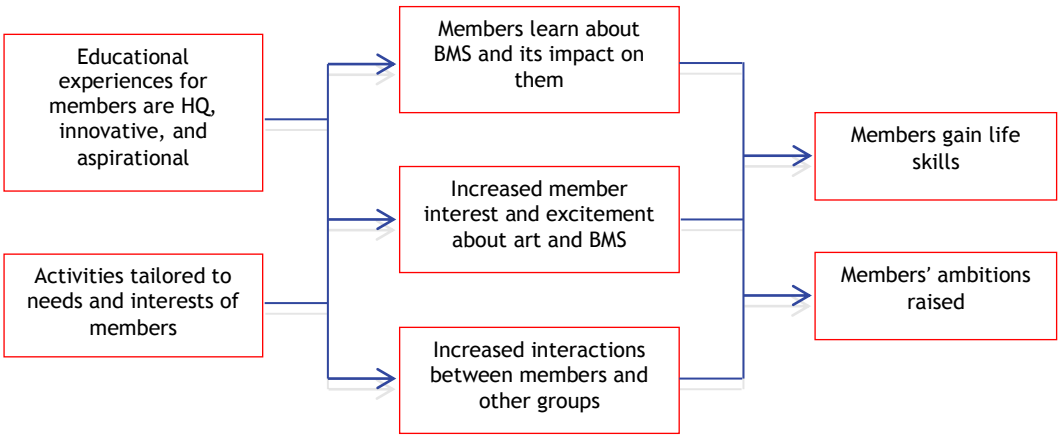
B Methodology

The project was designed to achieve a series of aims and outcomes, which can be grouped as shown below.

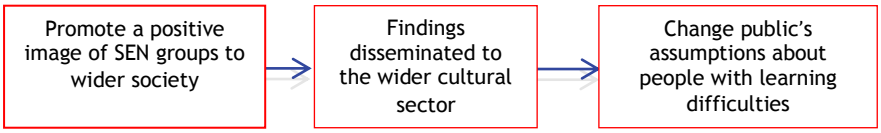
1. Impact on participating professionals



2. Impact on club members



3. Public perception of SEN groups



The evaluation was structured around these three areas. Methods used were mainly qualitative, as the overall numbers of potential respondees was small.

Specific methods used were:

- Observation of club sessions
- Questionnaires for key participants
- Evaluation forms for events and workshops

Having been appointed at the start of the second (or four) modules, the evaluator attended at least one session in each module for each club.

C Impact

1 Impact on participating professionals

1.1 The artists

The project engaged four artists and two content experts (a science specialist and a medical history adviser) as well as a number of specialists who helped deliver one or more sessions.

The artists were all well established in their fields (at least one had a significant international profile) and had prior experience of working in an education or workshop context. Three had worked with young people with learning difficulties, including one who had a long association with the gallery, which gave rise to a deep commitment to the project and its aims.

> *I began working with the young people in Octagon club close to its inception in 2008 and know many of the young people from different clubs in the borough. I have worked with some members in their homes and have transitioned individuals from their home into the club environment. As such, I already had close relationship with many of the participating young people. I have a deep care and through my experience, developed a strong determination for the children's development and enjoyment. I want to see them being able to support their own lives through having their art recognised.*
> (Artist evaluation)

The project brought together art and science. For one artist, this was a new venture, whilst the other three had a range of prior experience. This includes one with over 15 year's experience working at the art-science interface and who is:

> *A British artist whose work fuses craft, technology and bioscience to explore our relationship to the microbial world, biomedicine and technology. She has an international exhibition profile, having exhibited at The Picasso Museum in Barcelona, The Science Gallery in Dublin, The Museum of Contemporary Art (MOCA) Taipei, and The V & A Museum in London. Her work is held in several major public collections, including the Science Museum London and Eden Project. She is the founder and director of "The Institute of Unnecessary Research", a group of artists and scientists whose work crosses disciplinary boundaries and critiques contemporary research practice and won the 2012 Society for Applied Microbiology Communication Award.*
> (Artist's on-line CV)

A second artist described their experience as

> *I have worked in arts education for 24 years, in gallery education, formal education (FE and HE) and community settings. I've worked with a range of organisations including museums, regional arts orgs, charities, schools and youth groups. More recently projects have involved art and science. I worked on 3 Wellcome Trust funded youth combined arts projects with AllChange arts (Skin Deep, Playing God – both exploring genetics; and Comfort Zone – exploring the science of fear). In Higher Education, I established an*

> *undergraduate art and science programme, Broad Vision, which ran at the University of Westminster 2010-2015 and I am Course Lecturer on the Masters in Art and Science at Central Saint Martins, University of the Arts London.*
> (Artist evaluation)

This was a highly experienced, well-regarded group with a vast array of expertise to bring to the project. Their impact on the club members and gallery staff is described below. All the artists described significant impacts on themselves as a result of taking part in the work. This included

- Increased collaboration in the future with others involved in the project
- Increased understanding of [the artist's] future development needs (e.g. helping formulate an approach to doing an MA)
- Further development of a significant area of an artists work
- Being able to secure an Arts Council grant to develop an art installation, and running further workshops with students with learning difficulties
- Refreshing the skills needed to work with people with learning difficulties
- Receiving useful feedback and debriefs from the gallery team to improve delivery
- A sense of achievement, enjoyment and learning

The gallery team worked closely with the artists and content experts, and observed a series of impacts.

> *We think that each participating professional including artists, Science communicator and science researchers have been able to develop their ideas and practice in a new way – including their awareness of working with SEN groups, using art within science and developing new ideas inspired by other projects.*
> (Gallery team evaluation)

The evidence indicates that the project has a significant effect on the artists' professional practice, including how they see SEN young people and the implications for their own future work with such groups.

1.2 The content experts

Two main content experts were involved in the project. One was a medical/art history advisor, with a long history of involvement with the gallery. Her main role was to work with one of the artists on one of the Modules (Mapping the Body), where she was involved mainly in supporting the art history dimension of the work, for instance in researching and presenting a session on the work of Muybridge. This led to a range of other session activities over the coming weeks. She also helped in the sessions that were based on dance and movement, offering expertise on movement/dance and yoga.

> *My PhD research is within a medical history department and looks at movement, sport and exercise for girls in the late nineteenth century. I got involved with this project because I wanted to explore ways to engage more people with the research, look at it from another angle, and to learn something myself. I am very interested in collaboration and interdisciplinary research. I wanted to challenge myself to work in a new way and consider my research, skills and knowledge from another perspective. I wanted to connect with artists with mutual interests.*
> (Content expert evaluation)

The other content expert was a science communicator/presenter with a specialism in working with children and young adults with special educational needs and disabilities. Her main role was to ensure that the science aspects of the project were appropriate for the club members. She was recruited to the project team following a recommendation by the Wellcome Trust. Whilst not having prior experience of an overtly science-art project, she had experience of children using science to create 3D objects using art and craft materials and processes. She attended all steering group meetings (prior to each module), and she reviewed session plans for science content and attended some sessions, exhibitions and the dissemination day.

Both experts brought considerable and useful expertise to the project. Having a science adviser to assist in developing the modules was a particularly good approach. The alternatives (having no science adviser, or having a scientist linked to each module) would have been, on the one hand, reliant on artists' scientific knowledge, and on the other, beyond the scale and scope of the project.

The content experts also identified impacts on themselves.

> *I always left the sessions feeling uplifted and more connected to community. Overall I found that working with the groups was the most rewarding aspect of the project, rather than the collaboration with artists, which I initially thought was most interesting.*
>
> *It has shown me a new way of approaching science and adapting it for this audience….. This kind of group embodies how I like to do outreach. Because everyone is comfortable in their surroundings and with each other, it means that new topics can be introduced – far more complex topics than could be explored if you took the students out of their comfort zone. It fits perfectly into my "take the science to the people" method*
> (Content expert evaluations)

Impacts on the content experts include:

- Being able to further develop ideas
- Understanding of how an art-science project works
- Development of professional practice related to outreach work
- New activities to use with a range of audiences
- Future links with the gallery

The aim to impact positively on the work of the content experts was achieved. As with the artists, this impact was evident. Taking the artists and content experts together, the project has helped a group of professional workshop providers and advisers to become more knowledgeable and skilled in running activities with young people with learning difficulties, which is a significant outcome of the project. This will be a legacy effect, increasing the sector's capacity to work effectively with people with SEN.

1.3 Gallery staff

This project broke new ground for the gallery staff. The impact of the project acted at a range of levels, including learning new art and science skills (e.g. Shibori felting, DNA extraction), increased understanding of how art-science projects work, and increased awareness of how complex projects need to be planned and run. It was, in their own words, a 'HUGE learning curve'.

HUGE learning curve!
-Much more understanding of what biomedical science is and how to use science within art
-Learnt new skills in different ways of making e.d Shibori felting, extracting DNA with strawberries, newspaper rolling
-Inspired by the how much the young people were able to learn and grasp from complex themes
-learning how to work with scientists and artists who use scientific research within their practice
-Importance of sharing and disseminating in raising awareness
-Importance of family attendance on trips including siblings, children…
(Gallery staff evaluation)

These impacts are significant. Along with the impacts on artists and content experts, this project has increased the gallery's capacity to engage with young people with learning difficulties in future projects. *From the Outside In* was a complex undertaking that had multiple contributors and activities. Managing such a project required considerable skill and confidence, not least at the planning stage when all the elements had to be conceived and put together to make a coherent whole, which they did. The one element that required more effort than had originally been planned was the resource boxes, which were rescheduled to be produced in the term after the main project (i.e. the workshops) had been completed. Given the effort of running the main project until July 2016, including dissemination events, and the 2 days per week the gallery staff were able to commit to it, this is not surprising.

2 Impact on club members

The project was built around four modules, each covering a different aspect of biomedical science

Each of the 4 projects included a different theme linked to the body and how it works inside and out. Each project made the groups aware of their own body and how it works e.g Memory & Movement allowed the members to explore how the brain works, Genetics & the Digital Age explored our DNA, Mechanics of the Body looked at our skeleton and organs and how they are connected/work as one and Mapping the Body developed an awareness of what's going on inside the body during movement
(Gallery team)

2.1 High quality experience for members

A key aim for the project was to provide club members with educational experiences that were high quality, innovative, and aspirational. These are all difficult to measure precisely, but there is evidence that the aim was achieved.

- That the experiences were of high quality was planned for in how the project was set up and run.
- The recruitment of four highly experienced artists, with track records of working with the public, in education and (for some), with participants with learning disabilities
- Wellcome Trust advice was taken to involve a science communicator in the design of each module, to ensure high quality science content

- Other subject experts and contributors were used in some modules, or for some individual workshops
- Each module was preceded by a steering group meeting, which involved gallery staff, the artist responsible for the module, and the science content expert, where the outline of the module and specific activities were planned and discussed, including science content
- Each workshop was resourced with sufficient materials to allow the activities to proceed as planned
- Outputs were saved, and used in public exhibitions to showcase the work of the project
- Artists and other contributors high quality provided stimulus materials and activities, including video, pictures, song and dance, and objects

> *We think that each participating professional including artists, Science communicator and science researchers have been able to develop their ideas and practice in a new way – including their awareness of working with SEN groups, using art within science and developing new ideas inspired by other projects.*
> (Gallery team)

One parent stated:

> *High quality tutors who used a wide range of engaging techniques to demonstrate key scientific concepts like memories, emotions, connections in the brain and circulation in the body*
> (Parent evaluation)

The evaluator attended several sessions in each of modules 2, 3 and 4 (module 1 occurred prior to the evaluation commencing), and the quality of provision was as would be expected given the quality assurance measures listed above.

2.2 Tailoring activities to needs of members

This is a feature of good teaching and workshop provision, involving flexible planning skills and alertness to individual and group needs. Members had a wide variety of interests, and aptitudes so tailoring each activity or workshop was a considerable challenge, but one which the artists and gallery staff achieved.

> *The young people present [in the two groups] all have different needs, wants and interests and I therefore included a high level of flexibility into the initial planning. I emphasised an enquiring, emergent and responsive process of investigation - process based work allows for time and individual response to material and considers the emergence of the art form to come through a process of engagement therein.*
> (Artist evaluation)

> *My sessions tended to involve a number of activities building on the theme for that week – so people could join in if arrived late and work at their own speed on what they enjoyed. The last two sessions we arranged them in 'workstations' so people could move between activities and choose.*
> (Artist evaluation)

> *…if an activity was going particularly well and engaging the group I would allow it to run for longer; if the group weren't really engaged with an activity we would move on more quickly to the next thing. We had additional things we could bring if need, and enough helpers to accommodate individual*

needs. For example on the last session we ran a movement workshop with external guests from Amici Dance Theatre. One participant was not interested in the movement and soon withdrew. He loves drawing so we set him up on the side of the group to do some drawing. The workshop leader was great at including him at key points and used his drawing as stimulus for one of the movements the group did – we all made a human train inspired by the train he had drawn.
(Artist evaluation)

Individuals supported so that they can succeed at tasks or left to work more independently to take tasks further or interpret them as they wish.
(Support staff evaluation)

Sessions were run according to the needs of individuals, within the overall programme of the project. Whilst workshops often began with a single task being introduced (after a science stimulus), members were able to take things at their own pace, and often in their own direction. One module team which involved two artists, a content expert as well as the gallery team, organised to share feedback on how each session went, which showed how different activities were handled, how changes were ade on the day, and general comments about what worked well etc. This is shown (including the full module plan) in the appendix.

Taken overall, the team achieved the aim of tailoring sessions to individual needs.

2.3 Club members' own views

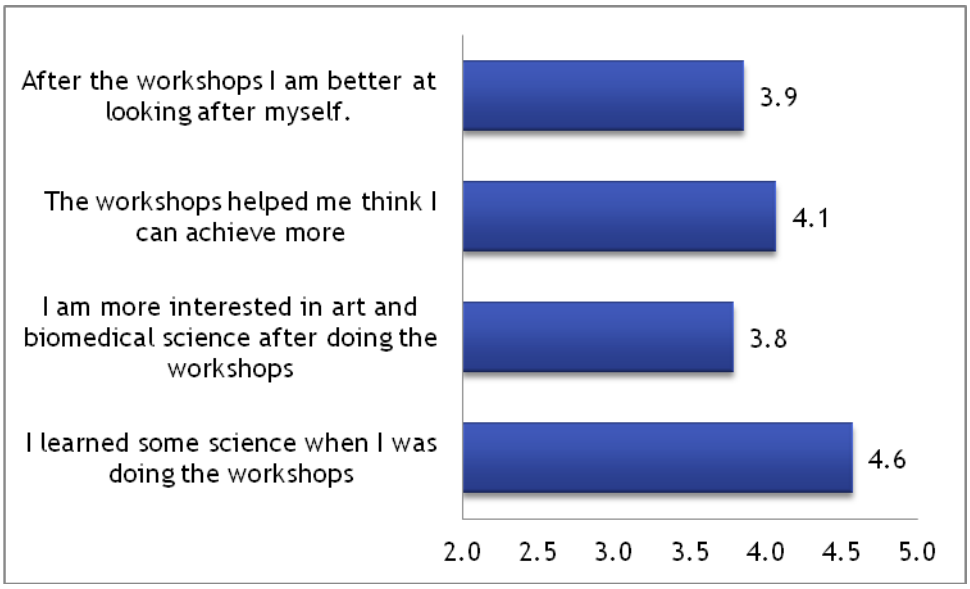
Members were asked (via a high-graphic questionnaire, and assisted if necessary by support staff) how the felt about the workshops. Members had to select from *None of the time* (scored 1) through to *All of the time* (scored 5).

A score of 5 would result from all members opting for the maximum value (5, *All the time*). Apart from 'I felt comfortable' all option scored over 4. Members felt happy, safe and secure and engaged. They enjoyed the company of other people and talked to them. Perhaps sitting on hard chairs for several hours was not the most comfortable way to spend time.

Obviously, the impact of the sessions was difficult to capture via an evaluation tool. Various effects of the workshops on individuals were also observed by participants.

> *During the Amici workshop, Toby was able to relax and feel in control as he became the centre of attention in one activity. This was a lovely experience for him and the rest of the group who could see him in a calmer light. This was very well facilitated by Amici who allowed Toby the autonomy he needed to feel valued and at ease.*
> (Content expert evaluation)

When asked about what they thought (on a similar 5 point scale, 1 being *strongly disagree,* and 5 being *strongly agree*) the evaluation found:



These responses suggest that members thought they had acquired

- Life skills (*I am better at looking after myself)* – score 3.9
- Self confidence (*The workshops helped me think I can achieve more*) – score 4.1
- Increased interest in art and biomedical science – score 3.8
- Some science learning – score 4.6

So, when asked, members thought they had learned some science. This is a difficult outcome to measure objectively. Members were of different ages and backgrounds, and had different levels of familiarity with school science.

> *I was able to chat to members and see how they grew and became familiar with the work over time. They were much more confident in trying new techniques as the project progressed. With some of the non-verbal students it was difficult to establish how much scientific knowledge they had gained whilst with others I was able to chat about what their artworks were and why they had used the materials they had chosen.*
> (Content expert evaluation)

Members were able to identify specific things they had learned, or at least remembered having covered in workshops. In their own words:

> *That you can learn anything you want to. When the brain is functioning during the day it works faster.*

The veins are there because they carry oxygen

Bone. Bone marrow, structure of bone

I have muscles

Genes. Muscles. Bacteria. Heart. Bones.
(Member evaluations)

Whilst the science recalled may be less than precise, (eg *The veins are there because they carry oxygen*) this does at least show that the member could link the circulation system ('veins') with one of its main functions (carrying oxygen)[2].

Another member reflected on how it was different to learning science at school.

Before I did science at school I learned about things but they were hard to understand. Because we are mixing science with art it is much easier to understand especially about human beings
(Member evaluation)

Science in schools is sometimes criticised for being taught in a way that does not reflect the everyday experiences of young people, and that it is taught in a fairly abstract way. The approach taken in *From the Outside In* may be applicable in more mainstream settings.

One artist explained her perception of how members had learned about science, in a fairly striking way.

In a later session, he had a discussion with Dr Lewis Goodings on how an orange is like a brain - delicate with interconnected segments and smaller interconnected cells.
[Club member] directed a discussion about experience that incorporated each sense. This was part of learning about how all the different areas of the cortex are connected!
(Artist evaluation)

It was also clear that the learning about art through movement and dance had also made connections in some members' minds, the activities providing a context for learning some biomedical science.

Members in the group would often surprise me with their insights and observations. Of particular note, when doing the movement session on the last day, some members expressed themselves in a way they hadn't in previous sessions – the music and dance releasing them in some way. When talking about the work they had made, some made interesting observations about how their organs work in their body demonstrating knowledge of complex interconnections. The way we ran the sessions, we didn't 'teach' science in a didactic way, but related the science (the biological workings of the body) to the creative activity, finding ways to express the body's functions, limits and possibilities.
(Artist evaluation)

Members also suggested that they had learned about art during the sessions.

[2] Veins carry *de-oxygenated* blood back to the heart from where it is sent to the lungs to become re-oxygenated.

Collage. Marbling. Sculpture. Drawing. Casting. Felting. Drawing around Mike.

How to make skeleton structures from rolled newspaper and how to make felt

Plasticene. How to cast.
(Member evaluations)

Precise measurement of the learning achieved through the project, particularly about biomedical science, is difficult to achieve within the projects scale and scope. The responses above suggest that some learning had taken place, but the difficulties encountered by some members were noted by some respondents to the evaluation.

Less easy to ascertain in [Club member's] case due to his autism and learning difficulty. I can definitely say he was interested in memories and emotion, because I witnessed them.
(Parent evaluation)

The project is interesting and very enjoyable but I think that especially my client's not always understanding everything (eg biomedical science – too complicated a subject to talk about).
(Support staff evaluation)

Members also suggested areas they would like to learn more about, and gave examples from both science and art.

Illustration and to learn about the heart.

Using more modelling materials

Painting. Effect of painting. How to make effects like snow and fire.

Group work. Electronics. Animation.
(Member evaluations)

Members were also asked what they could do now that they couldn't do before, which uncovered a wide range of newly acquired skills. One member gave a particularly comprehensive list:

Dance, painting, animations. Photography. Working with clay. Weaving with threads. Fine hand work. Looking at composition with collage. Drawing around Ben's body. Making bones technique. Using technology to make art. Making parts of the body with different materials. Making conceptual art. Choosing blue and dancing with painted feet.
(Member evaluation)

Other new skills included casting, using a stethoscope, using a paper-rolling machine and dancing.

When asked abut what they found hard, there were not many examples given, in fact, in response to that question two members wrote 'Nothing' and 'It was easy'. However, following the evaluator's observation of around six workshops, members did seem to find most activities challenging but were able to master the particular techniques to some degree each time. Indeed, the evaluator tried out most activities, and found them sufficiently challenging himself!

The challenge of doing the activities was captured by one of the artists:

> *We used some technology, using apps on the iPad to take heart rate readings after doing different movements (i.e. higher energy = higher heart rate). It was physically challenging because to use the app required fine motor skills to press the right buttons at the right time; it was also conceptually challenging for everyone in the group to understand what the numbers meant in relation to their own anatomy and the activity they were doing. More physical ways of taking heart rate readings were more successful so we stuck to those for future sessions, such as finding your own heart rate with your fingers; listening to each others heart rate using a double headed stethoscope; creating sounds and movements of the heart beating*.
> (Artist evaluation)

Measuring increases in members' ambitions is difficult, and is possibly best observed by changes in member behaviour over time. However, these observations paint a positive picture.

> *[The club member] has an interest in film, which was nurtured in the last project. Really, I feel that all the group's ambitions were nurtured. They love the groups and coming is an expression of this for them. The fact that they engaged and made such beautiful work is a sure sign that they were developing their interests and skills throughout. Their process in this will help to form clearer ambitions for them in the future.*
>
> *Some members commented on how proud they were of the work they had made and how they had contributed in the sessions. Seeing them at the exhibition opening was great, there was a huge sense of achievement at seeing all the different projects, the different subjects explored, techniques used… over 6 months represented in one space. I think they appreciated that people enjoyed the work and they appreciated getting a certificate of achievement.*
> (Artist evaluations)
>
> *Seeing how the students responded to the well-attended final exhibition demonstrated how they felt they could achieve more. Some of them were very comfortable with public praise but for others it was clearly very challenging. The project has increased member's social skills in terms of interacting with the public and artistic professionals. This will also improve the life skills of confidence and independence.*
> (Content expert evaluation)
>
> *Have seen members' confidence in grasping advanced concepts develop by using technical equipment and language. Would hope to see members talking about some of the themes we looked at in future projects, using the work created in portfolios, an ability to share the project with others*
> (Gallery team)

3 Public perception of SEN groups

The project aimed to promote a positive image of SEN groups to wider society, thereby changing the public's assumptions about people with learning difficulties. The key methods used to achieve this were public exhibitions (eg during World Autism Awareness Week), dissemination events and outreach work.

Public exhibitions took place on April 4th – 8th (exhibition during World Autism Awareness Week), June 20th (SEN dissemination event) and July 12th (end-of-project showcase). Visitor evaluation forms were made available to visitors. Across the three events, 17 forms were completed, all involving free-response answers.

Many visitors already had a very inclusive view of young people with SEN. Others had their views changed for the positive. This included, for at least one visitor, overcoming a previously-held misconception.

> *I was worried that I didn't know how to behave around them in a way that isn't patronising. But they were brilliant.*
> (Visitor evaluation)

This visitor also observed "[The members benefitted from] more confidence in themselves being around other people in a safe environment and happiness and fun".

Other comments included:

> *It conformed my experience and belief in the benefits of participation in Arts projects*
>
> *It made me think again of how important these projects are*
>
> *I think that people with learning difficulties are not necessarily unintelligent they just have a different intelligence and ways of thinking*
>
> *Capable of more than some people think. They work had and care about what they produce.*
> (Visitor evaluations)

The third comment is interesting, in that it perhaps relates to Gardner's theory of multiple intelligences[3]. Although not currently in favour in the psychology community, it does have some traction in education, at least at the pragmatic level where, it suggests that we should individualise teaching *style* (to suit the most effective method for each student), and pluralise the teaching (teach important materials in multiple ways). *From the outside* in did both these things (if we can equate the workshop to 'teaching') – highly individualised activities, and a wide variety of activity types within the same topic area. Although this in itself is not an impact on public perception of SEN groups, it does show that young people with learning difficulties can exhibit considerable achievements if they are subjected to an individualised and pluralised 'curriculum'. This may have implications for teaching and learning in the wider context of schools. The project could, therefore, be having a positive effect on assumptions about people with leaning difficulties, about what can work in these circumstances, and whether 'what works' here can have application in wider contexts. The small sample size makes further analysis problematic, but in the evaluator's view there is scope for further dissemination of the wider findings of the project.

[3] Gardner, Howard. *Multiple intelligences: new horizons n theory and practice*, 2008.

4 Early feedback from the Arts Award art & science resource box

As stated on p2, the project has also created a resource box that was piloted in December 2016 with three schools including one for pupils with SEN. The pilot sessions used some of the project themes, including aspects of the science curriculum. Two artists were commissioned to create the box, which contains engaging objects for users to interact with. These resources are now being used along with the Arts Award Discover to underpin a day-long workshop including art and science in local schools.

Early feedback from teachers is highly positive. Pupils were able to access the materials – and the inclusion of images helped some SEN pupils. Stimulus activities were positively received, with one teacher suggesting that they gave them good ideas for future use. It was agreed that there was the right balance between the art and science. Pupils responded well to the activities.

> *Yes – I was surprised how much science was covered and it was really well done through art. The children enjoyed it and learned a lot. They learned things I wouldn't have expected and the art really helped them enjoy themselves.*
>
> *They loved the activities and they could present what they had learned very well.*
> (Resource box teacher evaluations)

Teachers largely felt the resource box contents were sufficient in themselves. Only one teacher suggested something that might be added – videos, for use in explaining things.

Teachers also valued the link with the Arts Award.

> *It was great for the children to achieve something in a short space of time and be able to see the process. It was really good that all children could access it and achieve the end result. The children had access to many different art types and processes that they might not have experienced otherwise. They could feel happy and proud of what they achieved.*
> (Resource box teacher evaluation)

Both teachers and pupils seemed to have learned from the workshops, in terms of science content knowledge ('how the brain works, how the digestive system works'), pedagogy ('approaches to combining science'), about new artists, and how to combine different subjects in the classroom.

In the evaluator's view, the project as a whole, and the resource box in particular, have lessons for mainstream science education, in terms of how to make the subject more accessible to students of all abilities. This could form a strand within any future dissemination programme.

D Conclusions

The overall approach
The project adopted a *science-informed art* model of artist/scientist collaboration. Workshops began with a science stimulus (sometimes from cutting edge research) that led on to art activities, which reflected the (biomedical) science content being covered. Each module had input from a science content expert who was responsible for reviewing and checking the science content of each module. One module benefitted considerably from the input of a medical historian. This approach worked. The alternatives (having no science adviser, or having a scientist linked to each module) would have been, on the one hand, reliant on artists' scientific knowledge, and on the other, beyond the scale and scope of the project.

Impact on participating professionals
The professionals found this quite an intense experience. From detailed pre-module planning, to delivery, and on-going adaptations to plans and activities, professional input was of a consistently high quality. The impact of this experience on their own professional work was also significant. This included the further development of a significant area of an artist's work, running further workshops with students with learning difficulties and running further workshops with students with learning difficulties. Along with the leaning achieved by the gallery team this project has increased the sector's capacity to engage in art-science projects and to work with audiences with learning difficulties. This is a significant outcome.

Impact on club members
Based on effective quality assurance measures, this was a high quality experience for club members. Members felt safe and secure, comfortable, engaged and happy. They reported that they were better at looking after themselves and that they were able to achieve more in the future. They also reported that they had a higher interest in biomedical science and art after completing the workshops, and most of them learned some new science and acquired skills in both art and science. Observers (artists, scientists, parents) suggested that members' ambitions had also increased.

Public perceptions of SEN groups
Notwithstanding the relatively low numbers of the public being exposed to the project, there was some evidence that the project had had a positive effect on assumptions about people with leaning difficulties, about what can work in these circumstances, and whether 'what works' here can have application in wider contexts.

Overall, this was a complex project with many facets, successfully delivered. The impact on all participants has been significant. It has added to sector capacity for developing art-science projects and for developing approaches for young people with leaning difficulties. There are a number of aspects of the project (eg the Resource Box) which could provide ideas for mainstream science teachers.

All participants benefited from (and enjoyed) the experience.

AUTHOR: Ken Mannion, formerly Director of the Centre for Science education at Sheffield Hallam University. Previous evaluation experience includes work for the Royal Society, the Department for Education, Engineering UK, the British Science Association, and the National Schools Observatory.

Appendix

An exemplar module, including workshop leaders' on-going commentary and feed-back.

Lesson Plan

Project / Course title: Mapping the Body 1
Freelance artist / tutor: Heather Barnett / Morgan Sinton-Hewitt
Dates: 6/7 June
Venue: Orleans House Transitions / Octagon Group
Aims: (what you want the learner/participant to achieve) Explore how the heart functions and create an image of it working in the body
Objectives: (by the end of the session the learner/participant will be able to) Listen to their own and others heartbeats. Make an outline drawing of their own body and decorate the flow of blood with a range of materials.

Time	Activity	Materials Needed
3.30	Arrival	
4.00	Introduction to project and heart	
	Find own pulse - pulse points Find other's pulse Listen to heart with stethoscope, own and others Take pulse - 1 minute	Stethoscopes x 5/6 (dual head preferably)

4.20	Observations of movement: heart as pump, Distribution Why is blood pumped around the body? Nutrients / fuel / healthy body Tree analogy Body as system: blood > nerves > signals to brain >	MRI video https://www.youtube.com/watch?v=G4dFVeP9Vdo Blood vessel video? Blood vessels images *Q: can we have a pigs heart available to handle?*
4.40	Body outlines (drawing on the floor) Partner up; choose drawing instrument;	Large white paper Pens/ pencils / crayons A range of drawing implements to choose from: *Q: can we project silhouette to get outline?*
5.00	Decorate body maps on the floor/table Start with the heart: collage the heart	Trays of materials: Paints / string / wool / glue Pens/ pencils / crayons
5.45	Clear up and share experiences: what we've learnt. Next week: movements that make our heart rate change (speed up / slow down)...	

Post session feedback:
Heather > We laid out the pictures of hearts and blood vessels on the table, so there were things to look at when people came in. The video of MRI heart beating couldn't play (council account not liking YouTube) so if you manage to download it locally that might work. The stethoscopes were quite subtle, some people found it difficult to actually hear, but everyone seemed to enjoy putting them on and searching for a pulse and some found one. We didn't attempt to actually take a pulse reading, as it felt like we should move onto the drawing exercise at that time (and we'll do this next week). Everyone made something, either a full body drawing, taking it in turn working in pairs to draw around each other, and then individually decorating them; or half or partial body with blood vessels. The activity worked well, some worked on the floor, some on tables, some were drawn standing up. Each drawing was unique to the maker in the way it was decorated and materials used including ribbons collage, drawing and felt. If people had finished their drawing they cut out and collaged the source pictures. I'll share some pictures.

Morgan > We followed broadly the same set-up routine using the same materials. Chris managed to get the right laptop so we were able to show the MRI heart footage which everyone found very impressive. There were lovely quiet moments of finding

and listening to heartbeats. We also use the hand-to-hand alternating squeezes to feel the pump action. Spoke about blood, nutrients and systems etc… The group arrived at different times so I began with the 4 - M, B, H and C and then gave a 1:1 intro to each newcomer as they arrived. This 1:1 was lovely and generated some quality learning time. C in particular, fed back to me 'Beautiful blood. Beautiful blood in my body' at the end of the workshop as she left the room. Same materials were provided as yesterday I think. Everyone made a full body drawing, again, each working therein very differently (see pics). Everyone worked on the floor. C and H made a joint picture, H began to collage the skin, as it goes on the outside of the body, she placed it on the outside edge of her body-outline - their silhouettes look very much like dancers! S chose to free-hand draw his silhouette. Parents loved it too. Great stuff. They are looking forwards to next week!

Prep for next week:

- Stop motion app already on iPads (there are 4 iPads, I can also bring mine - I have one too!)
- I'll bring a pulse sensor to take heart rate reading, to see how movement affects pulse.

Project / Course title: Mapping the Body 2
Freelance artist / tutor: Heather Barnett / Morgan Sinton-Hewitt / Betsy
Dates: 13/14 June
Venue: Orleans House Transitions / Octagon Group
Aims: (what you want the learner/participant to achieve) Engage with movement and sequence.
Objectives: (by the end of the session the learner/participant will be able to)

Lesson Plan

Time	Activity	Materials Needed
4.00	Sit in circle: move our names 'My name is xx and make a move'	Set up: Clear away tables, only chairs in a circle

	Everyone copies. Create movement for 'heart'	
4.15	Last week: Heart as pump to move blood around the body. This week: How can we change rate - what kind of movements?	
4.25	Intro Muybridge, sequences, types of movements - Betsy	Projection and Print outs
4.35	Take resting heart rate before - scientific approach Do a movement for 1 minute min Take active heart rate - compare (pair work) three sets of movement	Manual reading first, followed by with heart rate app (intro technology) - Cardio app is good.
4.50	In pairs: Create sequences of movements: from 'name', from 'heart' movement, or improvise	Props: Balls, chairs, teapot & cups (domestic items), small bean bags, light (shadows)
5.00	Record sequence of movements: - Whole body - Hand gesture - In pairs (join pairs)	iPads with stop motion app - Shoot outside against brick wall, or open space if fine.
5.45	Share (passing the ipads) and Discuss Favourite movement and end with group mirroring in circle.	

Post session feedback:
Heather > Morgan: First part went well, recapping on last week, looking at the video of the heart beat, moving names and copying worked really well (all stood/sat in a circle), as did hand as heart pump exercise, and Betsy's intro to Muybridge.
The main session - taking heart reading with Cardio app and doing stop motion movements with iMotion app worked well, but there was some time spent waiting for iPads, so at times some people weren't fully engaged in an activity, even though we put them into groups (one iPad per group). It was slightly chaotic at times, but worked well with some whole group movement animations outside. There are lots of animations saved at 8 frames per second on the iPads, which need to be sent to me (or posted somewhere that I can access) so I can edit them for next week. I'm happy to edit yours too.
It was difficult to introduce the heart rate monitors (the heart belts) during the main session - there was already lots going on - so I introduced them in the last half hour. It was challenging to put the belt in the right place and it needing to be against the skin meant it was too intimate for someone else to put it in the right place. This meant we weren't going to get proper readings. In the end I decided to fake it. Not

ideal, but it seemed the best thing to do in the moment - each person wore the belt over their clothes near their heart for three minutes and did some moving (walking, dancing, sitting). I said I'd bring in a wave image next week for each of them. Whilst it won't be accurate personalised data - I will use some data from other people I have on file - it will give them the basis for a heart landscape drawing. And, as Monday is an open day I'll need to run it slightly differently, to include other people in the activities, maybe we can do a long heart rate landscape on roll paper/wall paper whilst listening to a heart beating (I'll look for an audio track).
Not having genuine heart rate data also puts the idea of making audio tracks into question, and from the conversation with Chris today it didn't seem an easy translation.
I had a debrief with Betsy, with ideas for adding a bit more structure for tomorrow (i.e. types of movement suggested), making sure each group has an able helper/leader who can use the apps, using the inspiration images more directly. She'll feedback tomorrow.
Didn't take any photographs, but there are dozens of animations!

Morgan > Hi Heather,

We had a really great session. It fell roughly into three parts - A: i showed the heart MRI again and did an initial recap and mini exploration - the kids enjoyed moving their names again - we did the heart pump hand action as a group which got some smiles and Betsy did her thing - M (a young man) thought that the heart rate waveform looked like grass so I shared that we will be doing the landscape of the heart next week. the tech was slow at this point so we broke out for a bit and copied the dancer to raise our heart beats, listening before and after with the stethoscopes again and once satisfied with the difference, we then settled down to see the film.

We then explored making mini muybridges, individually, in pairs and as a group - lots of animations like you!!!

This felt like we had completed it by around 5.20 so we moved back in (we were outside at this point) and did some free expressive movement drawing on the floor. I allowed them to draw directly onto some of the heart rate images as well as using the muybridge directly.

We also didnt get photos- we missed some great moments though. For lots of the kids, the difference in heart beat was remarkable and made the difference between hearing it and not at all so it was great to use the steths again.

Prep for next week: look for an audio track to listen to whilst painting / edit animations /

Data to Chris - 1:1 representation to clearly link the previous activity with and a more expressive form chris.burton@richmond.gov.uk

Data to visual form:

Lesson Plan

Project / Course title: Mapping the Body 3
Freelance artist / tutor: Heather Barnett / Morgan Sinton-Hewitt
Dates: 20/21 June
Venue: Orleans House Transitions / Octagon Group
Aims: (what you want the learner/participant to achieve) **To work with heart rate data as visual and audio.**
Objectives: (by the end of the session the learner/participant will be able to) **To create landscapes of the heart, and/or audio tracks, then dance!**

Time	Activity	Materials Needed
4.00	Arrive Re-cap on last week - we took our heart	
	Recap: movement mirror	
	Screen animations	Compile animations -
	Remember how hearts felt from movement. Show prints of heart data	Print out heart data wave forms.
	Make paintings from heart landscape	From photocopies Need: String, clear acetate, marker pens, paints, roll paper or wallpaper
	Audio outputs?	To be tested

Post session feedback:

Heather > the session plan changed because of the Dissemination day, so we created a large collaborative landscape drawing taking heart beat waveforms as a starting point and inviting visitors to join in.

Morgan > so, I structured this slightly differently with octagon this week: I got them to find their heart beats again with the stethoscopes and make direct responses to this on A1 paper with a variety of materials - whatever felt right for the individuals to express in the ways that suited them - some nice pics which I will download soon to the documents folder…

We then got a big roll of paper and took it outside, using the heart rate data as inspiration for making a piece about the landscape of the heart.

The kids expressed a want to work into these two pieces more. I was thinking, to incorporate these, it might be nice to take them into the woods, create textures and collages there first and then to make trails with wool around the area, coming from this central piece and working out. They could then follow each others' trails… i thought it would be nice to include the i pads at this point again to create some more animations of this experience. It would be easy for transitions to do this too if you wanted to take the workshop in this direction… Bearing in mind that we will have betsy joining us here too...

Prep for next week:

I spoke to Josie about materials for trails and we may be on shakey ground with cornflour paste. She thinks wool/thread/ribbons and chalk are our best options.

She's 100% up for amici joining us in week 6 and to promote octagon and transitions coming to each others sessions to create a performance on the monday and rehearse on the tuesday. She said we should use the budget to pay ourselves to be in each others' sessions too.

As we have used so little budget so far, shall we increase the money we can offer to amici? I will aim to go to their workshop tomorrow night so i can participate and then talk to them about the collaboration in more detail… field trip!

Lesson Plan

Project / Course title: Mapping the Body 4
Freelance artist / tutor: Heather Barnett / Morgan Sinton-Hewitt / Betsy
Dates: 27/28 June

Venue: Orleans House Transitions / Octagon Group
Aims: explore how the body can be used for mapping our environment
Objectives:

Time	Activity	Materials Needed
4pm	Arrive and settle	
4.10ish	Intro the day - mapping with the body Betsy/Heather	Robin R images Richard long
4.25	Making gestures - from the heart - On wall near classroom, large paper or directly onto the wall.	Chalk, walls
4.45	Walking as mapping Listening to the heartbeat of the forest	String etc, ipads stethoscopes
	Collect textures (rubbings or different surfaces)	Paper, crayons, pastels, chalk
5.00	Set trails, everyone chooses a colour of string/wool/ribbon to wrap around trees and surfaces. camera/ipads capture in sequence animation.	Range of coloured string/wool/ribbon - one colour per person Camera /tripod - HB
5.45	Regroup inside and share experiences. Introduce praxinoscope for next week with demo cards.	

Post session feedback:
Heather > Morgan
We started by looking at photocopies of Robin Rhode sequences, drawing on walls - these are in the room for tomorrow.

Outside on the brick wall we taped a roll of paper horizontally (masking tape works if you're quick) and all went out to make gestural drawings with crayons. We did a large group drawing, exploring arms lengths, mark making and textures, some drew characters or faces, some abstract patterns and lines, and I took photographs every 10 seconds, which I'll edit as an animation and/or as a gridded sequence for next week [these can be printed for the exhibition]. We talked about which parts we liked and talked about doing individual wall drawings next week.

We then went inside and looked at the praxinoscopes, which captured their attention. So we built all of them and played around with the different cards and some drew their own or coloured in cards.

We then went out again to do the group drawing with string. Everyone chose a colour of wool/thread and wrapped it around and between the trees. People mentioned spider's webs, weaving, limbo... I set up the camera to timelapse the whole thing, but not sure if the threads were thick enough or strong enough colours to come out well on camera. Will need to see when I download the pictures. Again we talked about which parts of the giant web were most interesting, and some wanted to do more next week. It works best with thick brightly coloured ribbon and in a contained area, so lines of thread cross each other, when they intersected it was most interesting pattern wise.

We didn't use the stethoscopes or ipads in the end and didn't have time to collect texture rubbings.

I'll share the photos but it won't be before your session this week.

Morgan > Heather

We began talking about the Robin Rhodes pictures - everyone thought they were fantastic! We then explored some movement together, standing in a circle and moving arms to create different gesture and lines in the air - we even did some swimming!

I had the big roll of paper we used last week to create our heart rate landscapes on and Niki who missed the session really enjoyed walking up and down - like the richard long picture! I have this on the imotion app!

We then went outside, taped a roll to the wall and made a collaborative mark-making gesture piece. It then started to rain so we went inside. The kids loved loved this and it would be great to do it again if pos. The rain continued and curtailed out outdoor fun! So we explored the praxinoscopes, as you did and then moved onto the floor for some more gestural body drawing and a big piece about the rain outside! Everyone really enjoyed the session.

Prep for next week: for next week I will print out images from this week in sequences, so they can see the finished result from the group exercise. Participants can then decide what gesture drawing to make for camera, and think about weaving with ribbon.

Lesson Plan

Project / Course title: Mapping the Body 5
Freelance artist / tutor: Heather Barnett / Morgan Sinton-Hewitt
Dates: 4/5 July
Venue: Orleans House Transitions / Octagon Group
Aims: (what you want the learner/participant to achieve) Sequencing images and movements
Objectives: (by the end of the session the learner/participant will be able to)

Time	Activity	Materials Needed
4.00	Recap on last week by looking at sequences of gesture drawing and walking as mapping.	Print out sequences in 'Exhibition material" folder in google drive to discuss.
4.20	Lay out sequences in praxinoscopes, from photographs and/or drawn images	Could use some of the figures from last week, printed small enough to go onto praxinoscope, plus stills from animations of the group, plus hand drawn gestures coming to life through animation.
	Whilst some are doing praxinoscope, some can be making Individual gestural drawings for camera	
4.50	Group weaving patterns with ribbon.	Need to buy thick coloured ribbon.
5.20	Talk about possible sequences of movements for performance.	

5.30	Evaluation forms	Sort out who is coming on Tuesday 12 July.

Post session feedback:
Heather >
Morgan >
Prep for next week:

Lesson Plan

Project / Course title: Mapping the Body 6
Freelance artist / tutor: Heather Barnett / Morgan Sinton-Hewitt
Dates: 11/ 12 July
Venue: Orleans House Transitions / Octagon Group
Aims: (what you want the learner/participant to achieve) Develop movement sequences inspired by the heart for performance
Objectives: (by the end of the session the learner/participant will be able to)

Time	Activity	Materials Needed
	Introduce amici Warm up exercises	
	Recap on previous movement, moving names, heart, sequences	
	improvise	
	rehearse	
	Share experiences	
	Check who's coming on Tuesday for 4-6 session and/or private view/performance.	

Post session feedback:

Heather >
Morgan >

Contribution to exhibition?

SCREEN:

- Movement animations (Transitions & Octagon)
- Gesture drawing animations

PRINT:

- Sequence print-outs of ‘gesture drawing’ and ‘walking as mapping’ (group and/or individual)
- Photographs of walking as mapping activity
- Documentation photographs

ARTWORK:

- Body maps of heart and blood vessels (Week 1)
- Large heart landscape painting
- Large gesture wall drawing
- Smaller individual gesture drawings
