
Evaluation of Wondermind

'I was very pleased with the site, the children loved it... the production values are great.'

Teacher

Prepared for Wondermind Project Team, **Tate**

Prepared by Sean Mulkerne and Sarah Seymour, **EdComs**

11th Floor, Capital Tower, 91 Waterloo Road, London SE1 8RT

E-Mail: sean.mulkerne@edcoms.co.uk

Tel: +44 20 7401 4000

10th August 2012

Contents

1. Executive Summary	3
2. Background and Objectives	6
3. Methodology	8
4. Key Findings.....	10
4.1 Context.....	10
4.2 Case Study Observations	16
4.3 Response to Wondermind.....	17
5. Conclusions and Recommendations.....	33
6. Appendix: Survey Questionnaire.....	36
7. Appendix: Teacher Case Study Discussion Guide.....	44
8. Appendix: Family Case Study Discussion Guide.....	47
9. Appendix: Tate Liverpool Exhibition Discussion Guide	50

1. Executive Summary

Background and Method

Wondermind is an online resource for teachers and families consisting of games, videos and blog content that use themes from, and artworks inspired by, Alice in Wonderland to teach neuroscience topics to KS2 pupils. Led by Tate and managed by Sharna Jackson, Editor Tate Kids, the Wondermind project team comprised: Dr Michelle De Haan, Reader in Developmental Cognitive Neuroscience at the UCL Institute of Child Health (ICH) and Honorary Neuropsychologist at Great Ormond Street Hospital for Children NHS Trust; Phil Stuart, Creative Director of Preloaded and Martin Percy, interactive film maker. Wondermind was funded by the Wellcome Trust, through its Society Awards. EdComs was commissioned in 2011 to evaluate the site to understand how successful it had been in changing knowledge, awareness and attitudes towards neuroscience. The project involved a survey of KS2 Science and Art co-ordinators, observation visits to the Alice in Wonderland Exhibition at Tate Liverpool, and case study observations and interviews with teachers and families.

Key Findings

Findings revealed that:

- Wondermind has value as a resource for teaching and learning. All respondents believed that their pupils had learned about neuroscience as a result of using the resource, and many adult respondents believed their knowledge had increased as well.
- Respondents generally agreed that using sites like Wondermind to teach science topics through art and literature is more effective than traditional methods.
- Teachers and pupils are generally unfamiliar with the topic of neuroscience, but both groups indicated they were interested in the subject generally. Teachers generally felt that Wondermind was an effective tool for introducing neuroscience to non-scientific audiences.
- Awareness of Wondermind was generally very low amongst respondents to the online survey. However, when informed of the site's contents, respondents were interested in Wondermind and had high expectations of its quality, particularly due to its connection to Tate.
- Case studies suggested that the experience of using the site was generally positive, particularly for families. Teachers believed that Wondermind has had a positive impact on their pupils. However, teachers and parents both believed it was difficult to use Wondermind toward a larger objective – for example, planning a lesson around the site, or for continuous home study.
- Teachers and families indicated they found the subject matter to be interesting, noting that neuroscience is generally an interesting topic. However, both groups highlighted some challenges with the subject matter

on Wondermind, particularly the lack of explicit links to the curriculum, lesson plans, or strong ties to art generally.

- Reactions to the look and feel were very positive.
- The online and PC-based format of Wondermind was also viewed very favourably. While a few respondents noted experiencing some technical issues, many indicated that Wondermind fits into this format well. However, some respondents, particularly teachers, felt there was a lack of cohesion and navigability through the secondary materials on the site.
- Games and videos were seen to be strong as well; both teachers and families felt that the games in particular were well designed and enjoyable. However, many believed the videos were too long to maintain engagement. Additionally, some respondents, particularly teachers, suggested that as there is seemingly no new development, there is less impetus for long term use of the site.
- Teachers favourably compared Wondermind to other resources, noting the design quality and reactions from pupils. Families felt that the site was limited compared to others they had used.
- All respondents believed they would use the site in the future, but argued that further development of the site towards new games and videos is necessary to make Wondermind a continually used resource in the classroom or at home.

Conclusions and Recommendations

Responses to Wondermind were generally positive. Respondents believed that Wondermind has a great deal of unique value compared to similar resources, that it was able to generate interest and improve knowledge of neuroscience amongst pupils, and can be used in a variety of ways. However, awareness of the site was low amongst this sample and there were some issues around the ability to use the site effectively, such as by linking it to the curriculum or reinforcing other study topics. Additionally, some respondents perceived a lack of further development of the site, assuming that no new games or videos would be created. This perception contributed to a belief that long-term use of the site is less likely regardless of its overall quality.

The findings indicate that Wondermind has met many of its objectives. In particular, Wondermind is highly effective in introducing neuroscience content to non-scientific audiences, improving their understanding of the topic, changing attitudes, and generating debate. However, the website user experience was challenging; for example, in addition to the above issues, teachers highlighted challenges with navigating the site, the difficulty of the games and the time limits, while parents argued the site has low replay value without high scores or other multiuser functions. Improvements to the user experience would likely increase engagement and long-term future use of the site.

In order to enhance the performance of Wondermind in this space, the project team should consider:

- Re-evaluating the marketing strategy towards KS2 teachers and families in order to increase awareness and drive site traffic.
- Adding new content to the site, including new games and short mini-clip videos.

- Adding high scores to games and animation to videos in order to boost pupil engagement with the site.
- Establishing more direct and clear links to the curriculum.
- Developing additional lesson plans and making the presence of these materials on the site clearer to teachers.
- Linking the site's content more closely to art, leveraging Tate resources and branding. Consider adding art-oriented videos, or tying the science content to art topics.
- Improving connections to Alice in Wonderland by providing more story background and KS2 level content, such as short video clips or animated features.

2. Background and Objectives

2.1 Background

Tate houses the United Kingdom's national collection of historic British and international art, consisting of 65,000 works located in four sites across England, including Tate Britain, Tate Modern, Tate Liverpool and Tate St. Ives.

Tate Kids received funding from the Wellcome Trust in 2010 to develop Wondermind, a website and suite of games and interactive videos for children aged 8-12 and their parents, carers, and teachers. The site uses the art and story of Alice in Wonderland to introduce the subject of neuroscience in child development in a friendly and engaging way. The games and videos are intended to be both enjoyable as fun home and classroom activities, but educational as science and art resources.

Michelle de Haan is PhD is Reader in Developmental Cognitive Neuroscience at the UCL Institute of Child Health (ICH) and Honorary Neuropsychologist at Great Ormond Street Hospital for Children NHS Trust.

She obtained her PhD in 1996 from the University of Minnesota, and then carried out a postdoctoral fellowship at the MRC Cognitive Development Unit in London before being appointment as Lecturer at ICH in 1999. Her research applies neuroimaging and neuropsychological methods to examine the neural correlates of typical and atypical cognitive and social development.

She has published over 70 articles, books and book chapters in the area, and is Associate Editor of the journal *Developmental Science*. Her teaching work includes acting as Deputy Director of the MSc Applied/Clinical Paediatric Neuropsychology programme at ICH. Her work has been featured in BBC radio and television programmes such as *The Human Body*, *The Human Face* and *Child of our Time*, and she was the expert psychologist for the BBC television show *Honey We're Killing the Kids*.

Preloaded, a game design studio based in London, developed the site between 2010 and 2011, and the site was launched alongside the Alice in Wonderland exhibition at Tate Liverpool in November 2011.

Martin Percy is a director of interactive video. He has received three Emmy nominations and two BAFTA British Academy Award nominations. His work has won eight Webby nominations and ten Webby honourees. He has created interactive video pieces for Tate, British Film Institute and National Theatre, working with people including Sir Ian McKellen, Sir Derek Jacobi, Gordon Ramsay, Julie Walters, Tracey Emin, Jonathan Ross and Malcolm McDowell.

His interactive video pieces are integral to Tate Tracks, a marketing campaign which won a Gold Lion at the Cannes Lions International Advertising Festival. Martin is an associate member of the International Academy of Digital Arts and Sciences.

2.2 Research objectives

Tate Kids commissioned EdComs to evaluate the Wondermind programme in March 2011.

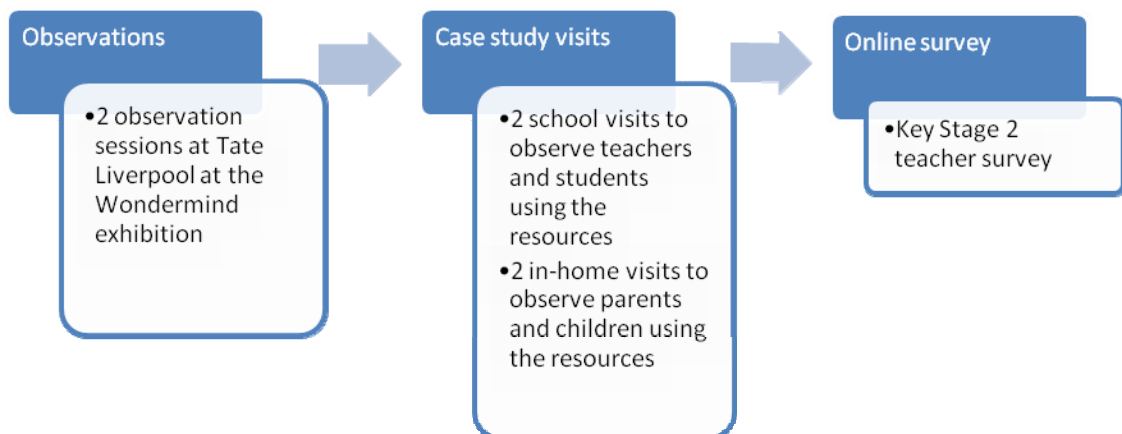
The objectives for this research were to assess:

- Introduction of neuroscience content to non-scientific audiences
- Improvements to knowledge and understanding
- Connection of audiences with scientists
- Attitude changes
- Generation of debate
- Website user experience
- User recommendations and future use

3. Methodology

This section provides a summary of the methodology employed in this research. Figure 3.1, below, sets out each method used and key activities involved.

Figure 3.1: Overview of research approach



3.1 Exhibition observations

A member of the EdComs research team visited Tate Liverpool on two occasions in January 2012. These observation sessions were intended to record how visitors to the Alice in Wonderland exhibition were spontaneously reacting to the Wondermind site, which was being displayed on computers throughout the gallery. The sessions were also used to gather informal feedback from Tate Liverpool staff concerning usage patterns and feedback on the site where applicable. Feedback from these case study visits has been analysed and included in this report, but the visits did not generate a significant amount of data.

3.2 Case study visits

EdComs researchers conducted four case study visits between 27th June and 13th July 2012, aiming to understand how Wondermind is used in target settings, record observations of reactions to the site, and discuss views of the site with target audiences. Two of these case studies were undertaken with KS2 classes in London schools, including a faith school in the Dartford area and a mainstream school in the White City area. The two remaining case studies were conducted with families with KS2 aged children, both in their homes in southeast London.

3.3 Online survey

EdComs surveyed 98 KS2 Science and Art teachers from across the UK between 15th May and 2nd July 2012. These were the same contacts that had received the initial marketing e-flier about the Wondermind project. The survey received 98

responses during this period. A breakdown of teacher roles for those responding to the survey is shown below.

Owing to rounding, percentages do not always total 100%. Where response categories are added together to create 'net' responses, the calculations are carried out with raw data and without rounding. Therefore, where these figures appear in the report, they may differ from those that would be achieved through adding categories together using the whole numbers displayed on the charts.

Figure 3.2 Teacher role

Base: all respondents (98)

Art co-ordinator	42%
Science co-ordinator	32%
Other co-ordinator	11%
Head teacher/Deputy Head	10%
Classroom teacher	2%
Other	3%

4. Key Findings

4.1 Context

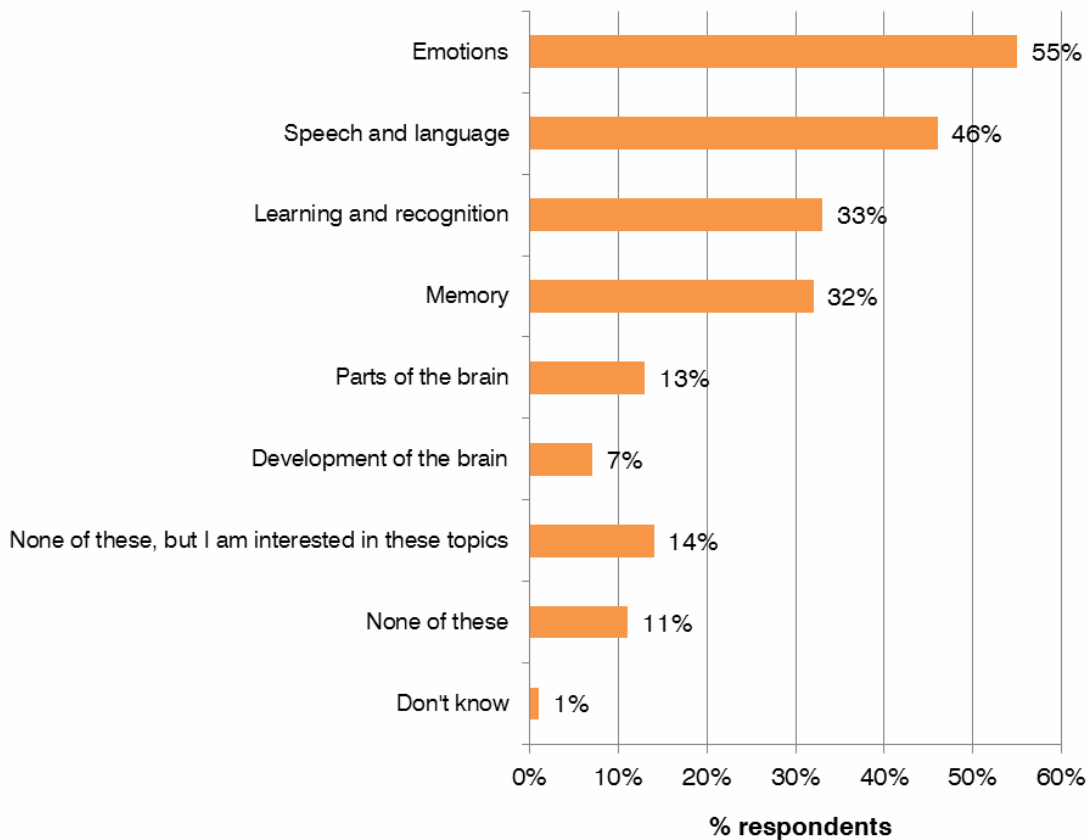
This section covers the respondents' prior knowledge of and experience with the topic of neuroscience, and highlights other resources commonly used in classrooms and at home.

4.1.1 Current knowledge and teaching of neuroscience

Teachers were first shown a list of neuroscience topics and were asked which they currently taught.

Figure 4.1.1a Neuroscience topics they current teach

Base: All respondents (98)



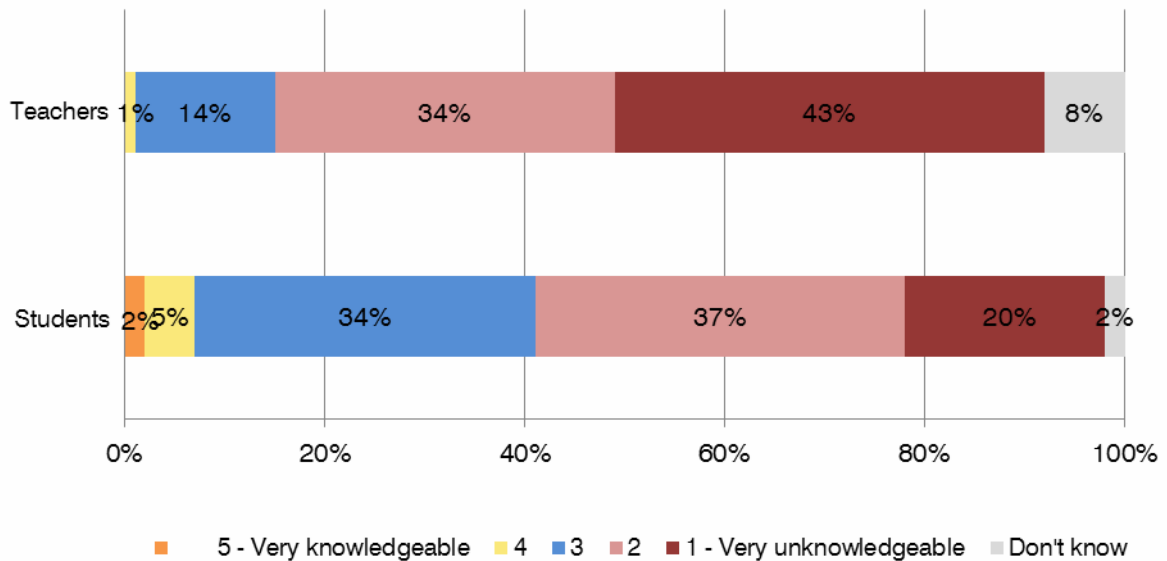
Among the topics listed, emotions (55%) or speech and language (46%) were most likely to be taught by teachers, followed by learning and recognition (33%) and memory (32%). Only a minority of teachers currently taught about parts of the brain (13%) or the development of the brain (7%). Around a sixth of teachers were not teaching any of these topics but were interested in them (14%), while a further one out of ten teachers were not teaching any of the topics and did not express an interest in doing so (11%). These findings suggest that, as the subject matter covered by Wondermind overlaps

somewhat with current topics taught at KS2, the site has the potential to support classroom learning.

Teachers were asked how knowledgeable they felt about neuroscience in general and then how knowledgeable they felt their students were about neuroscience topics, such as memory, emotions and parts of the brain.

Figure 4.1.1b How knowledgeable teachers feel they are and their students are about neuroscience

Base: All respondents (98)



Most teachers did not feel very knowledgeable about neuroscience generally; more than half felt very or quite unknowledgeable (57%), a third were neutral (34%) and just 7% felt quite or very knowledgeable. Even fewer felt that their students were knowledgeable about neuroscience topics; three quarters (77%) thought that their students were unknowledgeable and a sixth were neutral (14%).

During the case study observations, teachers suggested that neuroscience was a relatively new and unfamiliar topic for them. The respondents indicated they had covered a variety of subjects in science classes with KS2 pupils in the past – including the environment, light, electricity, life cycles, and friction – but neither respondent had taught neuroscience in class before. Moreover, neither teacher would characterise themselves as being particularly knowledgeable about the topic. However, they believed their pupils would be interested in the topic and could grasp the material.

I think most people are generally interested in these types of activities...because they are interested in themselves... It's one of those 'low challenge, high reward activities... they get a lot out of it... [they can say] I've learned something about myself [and] I didn't have to be a whiz kid.

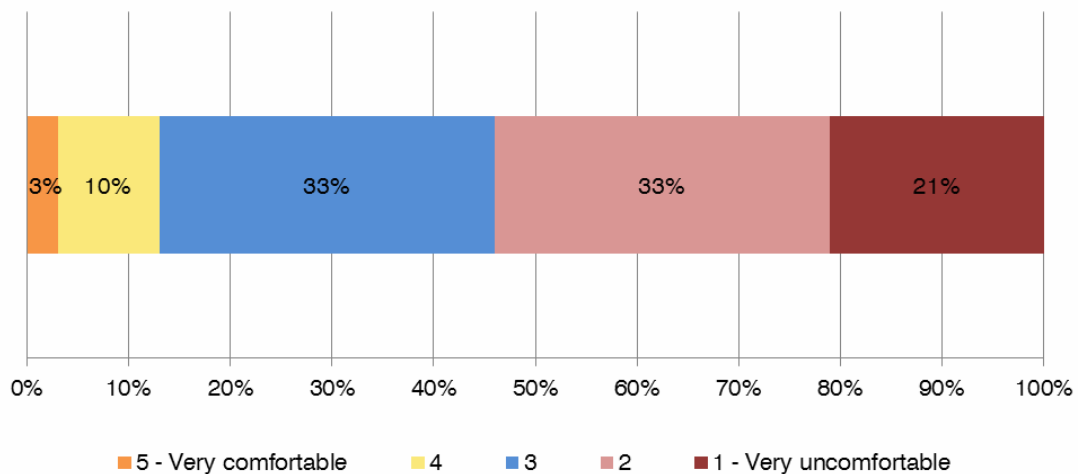
Teacher

The two families observed also indicated they had little experience with the topic of neuroscience. Both case study children said they found the human brain interesting, yet they were unfamiliar with the term ‘neuroscience’ and had not discussed the topic in classes.

Again, these findings suggest that a resource like Wondermind, when pitched at the right level, may be useful in supporting awareness and learning. There is wide scope for a resource that is of interest to teachers and targets pupils well.

Figure 4.1.1c How comfortable teachers feel are about teaching neuroscience

Base: All respondents (98)

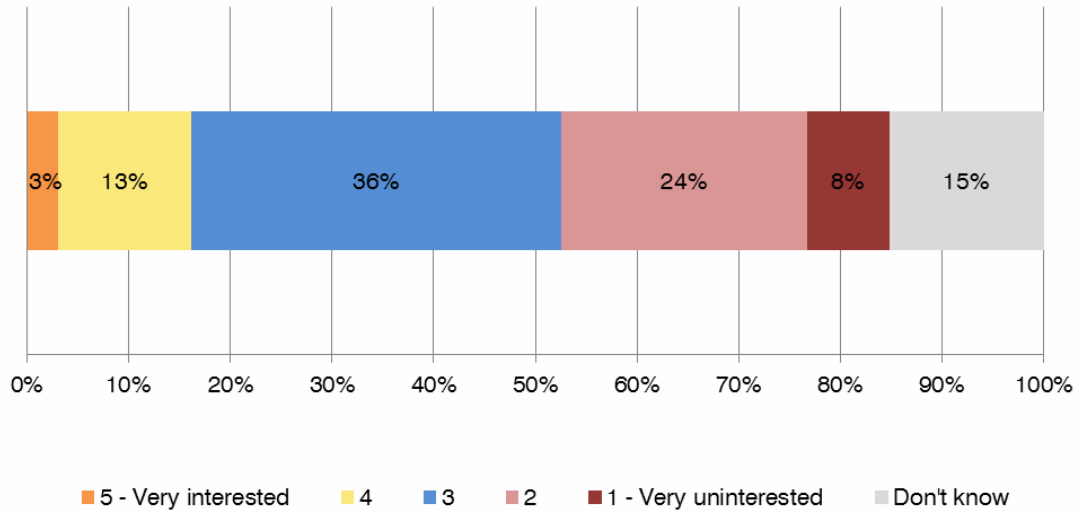


Only a minority of teachers (13%) felt comfortable teaching about neuroscience, while half (54%) felt uncomfortable and a third (33%) were neutral. This suggests a need for any resource dealing with neuroscience topics to go further in giving guidance and reassurance to teachers building lessons around these issues. This may include curriculum links, lesson plans and ideas, as well as links to third party resources for further information.

Teachers were also asked how interested their students were in neuroscience, such as memory, emotions or parts of the brain.

Figure 4.1.1d How interested teachers felt their students were about neuroscience

Base: All respondents (98)



Neuroscience is not a topic that many teachers felt their students were interested in; just 16% felt that students were quite or very interested, more than half were neutral (36%) or unsure (15%) and just a third (33%) thought their students were quite or very interested in neuroscience.

However, qualitative findings suggest that pupils do have some interest in neuroscience; while pupils spoken to did not seem to have any significant knowledge of the subject, they found the idea of their own brain or other relevant topics to be interesting. Similarly, one child at Tate Liverpool said they were interested in science, particularly biology and psychology, and that they were interested in the subject of neuroscience and the brain for artistic purposes.

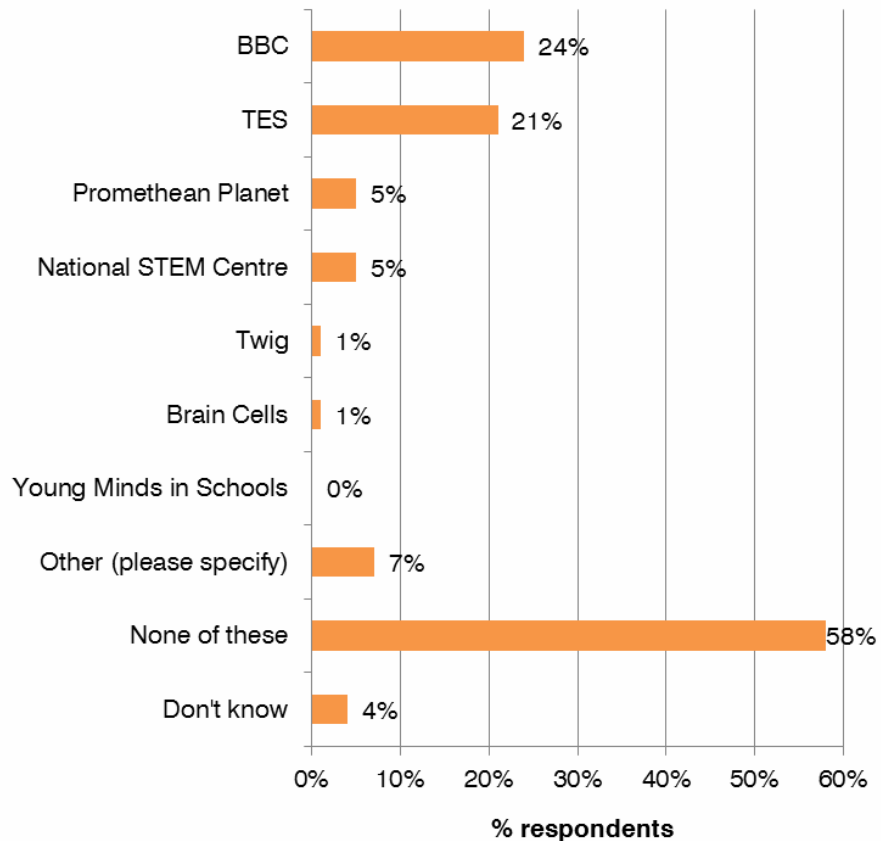
Again, these findings indicate that there is some level of interest in neuroscience topics amongst KS2 pupils, even without detailed knowledge. A resource concerned with these topics can build upon this interest and channel it into a strong focus for learning.

4.1.2 Neuroscience resource use

Surveyed teachers were shown a list of neuroscience resources and asked which they had used.

Figure 4.1.2a Resources used to teach neuroscience

Base: All respondents (98)



The most popular neuroscience resources were those produced by the BBC (24%) or found on the TES (21%). However, almost three fifths of teachers had not used any neuroscience resources (58%).

Teachers were asked to rate each resource they had used from excellent to poor. TES and BBC resources were rated as excellent or very good by around half of the teachers who had used them and only a minority rated them poorly. The other resources did not have enough users to enable reliable analysis of teachers' ratings.

4.1.3 Awareness of Wondermind

Respondents were asked to characterise their awareness and prior use of Wondermind.

Teacher feedback

Awareness and use of Wondermind among the teachers surveyed was very low. Only 4% of teachers had heard of Wondermind and only 3% had visited the exhibition. Half of those teachers who had heard of Wondermind said they had used the website. Of those who had heard of Wondermind, two individuals said they had received a marketing email, one 25% heard from another teacher, one said they heard from the school's senior leadership

team, and one said they had heard while attending the Alice in Wonderland exhibition at Tate Liverpool.

Of the two who had used the website, one was an Art Co-ordinator, while the other was a Co-ordinator of another subject, and neither had visited the exhibition. These teachers agreed with a variety of statements about why they decided to use the site with students. These included 'I liked the look and feel of the site', 'I like to use cross-curricular resources', 'my students like computer-based resources', and 'I liked the games-based approach to teaching science'.

Teachers from case study observations indicated that they hoped using the site in class would give their pupils a fun, active, and engaging activity that departed somewhat from the average classroom experience. As will be explored later in this report, teachers generally believed Wondermind achieved this goal. Very initial impressions prior to the lesson were very positive – both teachers indicated they had learned something from the site whilst preparing for the lesson.

I think, with this kind of approach, it's good for starting-off-the-day-type activities. It gets the brain fired up; it gets the interest going... you can give them a 5-10 minute activity, which gets rid of the sort of being half-asleep.

Teacher

However, one teacher expressed reservations prior to using the site:

I was hoping that there was stuff for the children to do... I liked the fact that it had the videos, but I did wonder why there wasn't more resources for class space.

Teacher

Parent feedback

Families had less well-formed expectations of Wondermind prior to using the site. Both families assumed there would be educational content, but neither expected there would be content that focused on science topics, largely because of the art-based focus of Tate.

I suppose I was expecting more visuals, because [the Tate is art]... I wasn't actually thinking it would be scientific.

Parent

I assumed because of the name that it would be educational... because [it's] a name you associate with art, with a very good reputation for substance.

Parent

These views suggest that a stronger or more explicit connection to science may be useful in managing users' expectations as to the content of Wondermind. The connection between art and science is implicit in the

resource, but making this a more explicit feature would strengthen its potential to engage users and change attitudes.

Both families consulted also assumed the site would be of high quality due to the connection with the Tate.

I assumed there would be quite a lot of research behind it, that it wouldn't just be thrown together.

Parent

Respondents at the exhibition at Tate Liverpool were generally unaware of Wondermind, suggesting that the resource was not a driver for visiting, but were interested in the site after they were provided details. One child expected the website to have detail about the brain's functioning, predominantly relating to dreams, as this subject was of particular interest to them. One parent respondent noted that their children use similar websites at home, and said they would possibly do so with Wondermind in the future.

4.2 Case Study Observations

This section will cover the observations from the case study visits in classrooms and private homes across London.

During the case studies, teachers using the site in the classroom opened the lesson in different ways that prepared the pupils for the remainder of the day's activities. One teacher commenced the lesson by discussing the topic of neuroscience with pupils, while the other linked the site more explicitly with Art, and with some elements of science. After the initial discussion, the first teacher handed out Tate-produced worksheets focusing on optical illusions for the students to work through. By contrast, the second teacher showed clips of Alice in Wonderland to discuss the topic of memory.

After these activities, students were introduced to the Wondermind website, and the teachers loaded the Garden card game onto an interactive whiteboard to discuss the topic of memory. Both classes played the game in the same way. Students were brought up to the front of the class in pairs to play the game; students would be quickly switched throughout the course of the game. In both instances, the students were very engaged with and excited by the games – for example, students sitting in their desks were actively shouting out answers to the game to the pairs at the front.

Both teachers moved onto the videos at the end of the game. Students remained engaged throughout the videos, paying attention to the presenters and answering questions throughout. One teacher stopped the videos at certain intervals to review certain concepts; this teacher had developed an entire presentation around the content of the video, rather than relying on activity sheets. However, the teacher seemed irritated when the presenters would interrupt her review sessions before answering multiple choice questions. Videos were followed by group discussions of the major concepts in both sessions. Students were student broken up into smaller groups for

activities – the first class used Tate produced worksheets, while the second used worksheets developed by the teacher. Students were engaged by the Tate produced worksheets in the first class, though not all students seemed to be able to complete the tasks.

During the observations with families, use of the site was far less structured – the children clicked through the site at random to experience the offering of games. The children seemed highly engaged by the games themselves, particularly the Garden and Hedge Maze games, and both children seemed attentive and engaged with the videos during the observation phase. The first family watched the video following the Hedge Maze game; while the child seemed engaged throughout, they eventually remarked that the video was overly long, and the parent felt that the video was giving too much information at once. The second family watched the introduction video to the entire site; both the parent and the child seemed very engaged with the content, discussing various subjects at different points. However, the child did not click on the video links following any of the games.

One family was also observed in depth using the site at the Alice in Wonderland exhibition at Tate Liverpool. Though the parent felt that more time and a different environment was needed to get fully acquainted with the website and understand it better, the family seemed to enjoy themselves while using the site, and they said they would be interested in visiting Wondermind at a later time.

Survey respondents indicated that they had used all of the games in class, but only one respondent had used a video, about the parts and development of the brain. These respondents said they had used the Wondermind website for independent student use, while one also said they had used the site throughout a classroom lesson.

The observations strongly suggest that Wondermind is an engaging, useful resource for teaching neuroscience topics at KS2 – able to intrigue pupils and encourage discussions and enjoyment. Additionally, the divergent approaches to using Wondermind in the classroom indicate that Wondermind is a versatile resource for lesson planning. However, the observations also indicate that the length of the videos may be disengaging for some pupils, and that some games may be too challenging. Nevertheless, all observations were very positive as Wondermind was used creatively and generated significant interest, indicating it has the potential to stimulate debate and heighten interest in the topic of neuroscience.

4.3 Response to Wondermind

This section will cover the views of respondents in both the case studies and the survey regarding the Wondermind site itself.

4.3.1 Experience with Wondermind

Case study participants were generally positive about their experience with Wondermind.

Teacher feedback

Teachers generally believed that their lessons using Wondermind went well – students seemed to be engaged by the website and the accompanying resources and did seem to be learning. In fact, one teacher was surprised at how easily their students engaged with the site itself, as well as the activities and group work planned for the lesson. The teachers also felt that the material was pitched well, particularly for high-ability students. Survey respondents also believed that their pupils had enjoyed the site.

I was very pleased with the site, the children loved it... the production values are great, which helps.

Teacher

The energy was quite high in this lesson.

Teacher

However, both teachers believed that using Wondermind effectively in a lesson was challenging. For example, the site is not linked to any specific academic outcomes or curriculum specifications, and it has few lesson planning materials or activities for classroom use. Similarly, while neuroscience is a very specific subject for science education at KS2, the site is not strongly connected to any other science topic. Therefore, teachers must develop other activities around the site's content. This can be especially challenging when the teacher does not have a strong background in neuroscience or similar topics.

I would probably try to put more outcomes at the end of the activities themselves [like direct links to the curriculum] that are scientific or artistic.

Teacher

[It is] very [tiring] to use [the site]... it doesn't take you through... I found I had to do a lot of work [to build a lesson]... and it should be [easier] as a resource for teachers.

Teacher

The teachers also generally believed that there should be more content on the site for teachers to make use of throughout a longer period, as the site is currently limited to short-term usage.

I would possibly try and develop a couple more games... you could use this [then] as something that each class could do for a term as a morning activity... and then the videos would go on and explain.

Teacher

Family feedback

Families were generally more positive about their experience with Wondermind – both found the site to be enjoyable and engaging, and the children believed they had learned something from the site.

I learned a lot about how your brain works, and like how your memory can work for playing those types of games.

Child

The games are very good... it is fun but it's also teaching you... I learnt stuff from it.

Child

Parents generally found Wondermind to be a strong, interesting resource, highlighting the links between learning and play. In fact, both parents felt they had learned something from the site as well. Unlike schools, children and parents at home do not require explicit learning objectives or links to the curriculum in order to support learning through using the site.

I'd quite like to sit and listen to the videos; I thought [the site] was quite interesting.

Parent

Both children believed that the games were very fun, particularly the Garden card matching game. One of the two children also highlighted the Hedge Maze game as being very enjoyable and challenging. Neither indicated any 'worst parts', but the children did not seem particularly interested in the videos. However, parents felt the videos were very strong, and believed there should be more of this type of content on the site.

I thought there would be more than one video in each section.

Parent

One of the two parents also believed that the site could be more engaging; for instance, making the site full screen and more interactive would provide for a better experience overall. Furthermore, using animated characters rather than presenters may be more engaging for some children.

The video could have been a bit more visual, like cartoony... since it's aimed at children, it could have been more interactive.

Parent

Concerns about curriculum links were less relevant for families, though one parent indicated that they liked to ensure that the resources being used at home have a strong connection to the overall curriculum, and having clear links makes this process less challenging.

These initial views indicate that Wondermind appears to be an engaging and interesting site to use both in the classroom and at home. The key challenge is support in linking the site to the curriculum and other learning outcomes, which is key to the resource being used effectively at school; however, home usage does not require this and so a separate area for schools with this information would be advisable to avoid putting off children using the site at home.

4.3.2 Detailed Views of Wondermind

This section will explore the detailed views of qualitative respondents regarding various aspects of Wondermind.

Subject Matter

Teachers and families were next asked to discuss a range of aspects of the Wondermind website, beginning with the subject matter. Respondents were generally very positive about the subject matter, but raised concerns about the lack of clear links to the curriculum.

Teacher feedback

Teachers generally believed that the subject matter is good and that it can link well to the curriculum, but teachers again made the argument that the teacher must establish curriculum links themselves without any guidance from the site. Moreover, one teacher argued that students need clearer links to the curriculum as this supports reinforcement of the content.

It could be good to have links to the National Curriculum so you know what areas of science you're covering... It could link to all sorts of things... but that would only be if you had flexibility over your curriculum.

Teacher

The second teacher highlighted similar points – as there are no clear curriculum links on the site, it can be difficult to tie the subject matter of Wondermind into other topic areas or activities.

Both teachers also voiced frustrations around developing a lesson around Wondermind. One teacher specifically argued teachers have to put in a great deal of effort to make the resource work effectively as part of a lesson. This respondent pulled together a wide variety of clips, sources, and activities from third party websites for the presentation in order to build a complete lesson.

I took the clip and the game from the site, but everything else I had to make... when you go to museums or something like that, their teacher resources are usually quite good, but [here] I was a bit underwhelmed.

Teacher

You couldn't just go and download [from the site and use it in class]... if it's aimed at schools and aimed at teachers, that needs to be tightened up... it needs resources and lesson ideas at least... because otherwise, you're limited by what you know [about neuroscience].

Teacher

This teacher felt there needs to be more assistance with lesson planning throughout the site.

There needs to be more specific lesson ideas. The theme is good, but practically creating a lesson from it was quite difficult.

Teacher

Both teachers also raised issues about the lack of art education materials on the site – links to art must be established by the teacher almost entirely. One teacher specifically highlighted the difficulty linking the site to art topics, arguing that more content should be developed to create these links, such as expert videos covering relevant pieces of art. Teachers believed that the site is very science oriented, and links to art had to be made independently. They felt that linkages would have more impact if they were made more explicit, especially considering the positive impact this would have for science material.

If you're trying to make a link between art and science, it needs to be more explicit, but if you're doing it just as a science resource, it's really good.

Teacher

These arguments were echoed by another teacher, who believed the site does not have enough explicit links with Tate, topics in art generally, and lesson planning around these areas and between art and science issues. Indeed, these issues were especially surprising given initial expectations that the site would be more art-based due to Tate's involvement in its development.

There is no link between this is an artist, this is their art, and this is how their brain may have been working to produce that art.

Teacher

Need more access to art that you can download and show to the children -- it's very difficult to find [generally].

Teacher

Nevertheless, both teachers felt that the site had strong potential to make these links. One teacher charted a possible curriculum link through both science and art, beginning with exploring the brain and understanding the self, drawing oneself, linking the exercise closely to surrealist art, then moving back to scientific topics. The site could also be used in literacy lessons, making use of diaries and discussing how people see themselves or how characters do the same.

[The site] could be used in a creative curriculum way – you could have science, you could have art as well... absolutely, they work [together].

Teacher

It appears that while the content is driven by the Wellcome Trust, the design and branding is dominated by the project team, leading to a perceived mismatch in expectation and reality. If the Wellcome Trust's involvement in the project were made clearer to teachers, this confusion may be assuaged.

Parent feedback

Parents generally found the subject matter to be interesting. However, as noted earlier, one parent found it more difficult to clearly link the site to wider aspects of the child's learning. Specifically, this parent believed it was difficult to link the subject matter of Wondermind to art topics, particularly as there was little reference to the exhibition at Tate Liverpool.

I found it hard to see the link to the art, and it would have been nice to see links to the exhibition... [with] interactive [activities].

Parent

This was generally not a significant concern, but this parent indicated that they prefer to link home resources to the curriculum where possible to ensure their child is learning the right material.

This respondent also questioned specifically whether or not it would be engaging for children, particularly given the complexity of the subject matter and the length of the videos.

I found it quite interesting, but I wondered whether [my child] would find it interesting.

Parent

However, the parent still believed that the content was clear and generally pitched well for KS2 pupils.

If someone says neuroscience, it sounds like it's going to be very technical and that it's going to be hard to take it all in... but I didn't find that when I was actually looking at it.

Parent

It is important to note again that both parents said they found the subject matter very enjoyable and interesting. Both indicated they had learned something from the site, and one parent in particular noted that the site had contextualised recent mental health issues in their family. This is particularly interesting as it suggests that Wondermind has potential for learning outside of traditional academic settings – non-KS2 aged individuals seemed to have learned from Wondermind, and it seemed to encourage conversation, reflection and understanding about these issues in a wider setting. Both parents agreed that they would likely explore the site's content further at a later date.

Look and Feel

Respondents were next asked about the look and feel of the website, including the links to Alice in Wonderland. All respondents were highly positive about this aspect of Wondermind – respondents frequently said that Wondermind seemed very well designed, specifically highlighting the visuals of the site as well as its music.

Teacher feedback

Both teachers agreed that well-designed websites like Wondermind are more effective in holding the attention of children.

It feels well done... [it] engages the children.

Teacher

One teacher felt that Wondermind felt ‘more like the BBC than ITV’ in terms of the quality of Wondermind, suggesting that the BBC’s resources pitch toward an engaged, technology-savvy audience and that Wondermind appears to follow this trend. The teacher also believed that users can detect Tate’s involvement in this resource due to its high production quality.

It's beautifully produced and the artwork is beautifully produced, even the layout and things you can click on.

Teacher

However, both teachers argued that it is difficult to establish clear links to Alice in Wonderland as the text is not covered in KS2 classes and many pupils are unfamiliar with the story. Moreover, one of the teachers felt that there is nothing overt in the site establishing these connections other than small images of Alice at certain points. This teacher suggested it would be helpful to have a summary of the story to make stronger connections.

I don't think the children would have found those [Alice] links – there's nothing on the site that lets you know that is the theme... It would be good if there was a part of the site where you [refresh] the story... just so students who hadn't read it can catch up.

Teacher

Parent feedback

Parents also felt that the site was well designed, highlighting many of the same strengths as the teachers. However, both parents raised concerns that Alice in Wonderland may not be relevant to their children.

Children just haven't read those books for a while... [my son doesn't] really know the story, so it doesn't make any difference to him. [NB: The child had seen the film version.]... If you said 'Spongebob Squarepants', it might be more interesting.

Parent

Both parents felt that the site was suitable for both boys and girls, though one parent (who did not have a KS2 aged son) believed that the Alice in Wonderland links may make the site somewhat less appealing to boys. One parent believed that the links to Alice suggest that Wondermind is oriented toward a certain type of child or family. The respondent did not provide much detail when probed, but their response seemed to suggest that the site is targeted at higher ability students or families from more affluent backgrounds.

[Tate] might be interested in attracting a certain kind of family with links to Alice... I think [Alice in Wonderland] a type of book that most children wouldn't know existed... the type of child who [is aware of Alice in Wonderland] might be the type who would know about [neuroscience] anyway.

Parent

Online and PC-Based Focus

All respondents were very positive regarding the online, PC-based focus of Wondermind, though some respondents, particularly the teachers, noted experiencing some technical issues or challenges during use.

Teacher feedback

The teachers believed that resources are often moving in an online-based direction, and therefore it is natural that Wondermind should follow the trend. Teachers also generally had positive views of the site's functionality and usability; both agreed that the site is versatile in terms of how it could be used in class.

You could do it in the afternoon as a fun science activity or in the morning as your focused high level activity.

Teacher

As suggested above, teachers also felt there was a lack of cohesion or guidance throughout the site, often leaving the visitor to their own devices when attempting to use the site as a resource. Both specifically noted the blog as being a confusing feature of the site – while they managed to find useful activities and resources in this section, there was very little linking these resources to the rest of the site. Moreover, the tags on the site and other navigational and organisational tools did not seem to facilitate the user journey as much as intended. For example, one teacher mentioned that there are no links along the top of the site denoting where the user is in the blog. One teacher even argued that certain elements of the blog have no clear reason for being posted, suggesting the blog has little direction.

Sometimes you think about things that people put in a blog, 'why is that there?'

Teacher

However, one teacher reported that the site would not always work properly when using the overhead projector – the site would be presented with the sides cut off. While this may be an issue with the classroom technology, the teacher also noted that the site has no full screen mode. This respondent also found that it was very difficult to comment on the blog, but acknowledged that this may not be a fault of the site itself. Yet, the teacher indicated that these or similar potential issues may be off-putting to teachers, causing them to not use the site.

If something isn't 'pick-up-able' and useable straight away..., [people would think] 'Right, I'm going to go and use something else then because this isn't working'.

Teacher

Again, these issues are likely due to the school's own equipment and therefore not a direct issue with Wondermind. Indeed, both teachers generally believed that the site was very easy to set up use once they were more familiar with the site.

The teachers highlighted some additional concerns that affected usability. For example, one teacher noted some difficulty with playing the videos, believing that they are hosted on YouTube, which is blocked by many schools. While this is not the case, it may be necessary to use another embedding method so that schools can make use of these materials. Another teacher found that certain games are too challenging for certain lower ability pupils – this is a particular issue as the lack of curriculum links makes it difficult to judge the level of appropriateness before using the site in class.

Parent feedback

Parents were very positive about the online and PC-based focus of Wondermind, noting that it fits in well with similar resources used in schools.

They use computers a lot at school; they have to do a lot of their homework on computers in secondary... I would be comfortable with [Wondermind] because it is associated with a big organisation [like the BBC]...

Parent

One parent also believed Wondermind was especially good for repetitive learning, as the games and videos could be played and watched repeatedly.

If it's anything that involves repetition, I think doing it on a computer is better.

Parent

However, as noted above, one parent believed that the site was not interactive enough to be engaging for children, and more could be done with the online platform to facilitate engagement, such as animation. Indeed, during home use, Wondermind would be competing against other, more commercial gaming sites that have high levels of interactivity and quality of design.

It's definitely educational... [but] it could probably do with a bit more [interactivity].... [You could] go from the game, and then some [icons or characters] come up with what [the subject matter] is to do with the particular game. I thought that the person talking is a bit intimidating.

Parent

One parent also voiced concerns about technical issues, including that the user cannot make the games or videos full screen, and that the volume generally seemed too low to be heard correctly. Addressing these relatively simple usability issues would likely positively affect engagement with Wondermind.

Games and Video-Based Approach

Respondents were also positive about the games and video-based approach of Wondermind. Responses were generally positive but some voiced concerns about usability.

Teacher feedback

Teachers believed that this aspect was very good as it kept pupils engaged with the subject matter. As this is the key unique aspect of Wondermind, this suggests that the site holds a distinct place within the range of commonly used resource, and is very appealing to users.

Games were really good, they look good, and the videos – although you know you're being taught something – I think they're really good, I thought they were really interesting and absorbing.

Teacher

However, both teachers argued that some of the games could be too challenging for lower ability pupils. This relates to the issues around curriculum links throughout the site – without these links, it is difficult to understand which single year group is being targeted.

[The students] liked the games, though there was one game they had difficulty with -- and I must admit I had difficulty with – the one with the Cheshire Cat. That one is a bit trickier to get going.

Teacher

I really like [the games]... but I don't really know what age [they are] aiming at... my kids would struggle [with some of the games].

Teacher

In particular, the time limits in the games can feel too short for students and particularly restrictive for classroom use – having a pause button for the games would be useful for larger scale use so that teachers are able to include more students and reflect upon the major concepts tied to the games.

I just thought I couldn't play [the mirror game] as a class... it would be nice to pause after each game so you can choose someone else [to play in the same turn].

Teacher

Similarly, one teacher believed that the games can be challenging for ESL students – this teacher chose the Garden card game as it was the simplest of the four for a majority non-native English speaking class. Moreover, the

introductory text before the games could be made less wordy to be more comprehensible and accessible to all pupils.

It should be a lot less wordy... it should be a lot more relaxed.

Teacher

With regard to the videos, the teachers shared a number of positive views. Both teachers felt that the videos were the best part of the site for their lesson, and particularly highlighted the use of experts in addition to the presenters as a strong feature of the site, as these individuals gave a credible alternative to everyday teaching in the classroom.

I think that the video where it explains some of the vocabulary and then cuts to the experts was good, because it's just good to see the title of the doctor... it's another expert that reinforces some of the content that [teachers and presenters] are saying.

Teacher

However, one of the teachers felt the videos were too long, causing children to become disengaged over time. The amount of video could be displaced by having more educationally stimulating games.

The videos are quite long and to get children to sit there for the whole time... would be quite difficult. Maybe have shorter videos and a few more games.

Teacher

One of the teachers believed it would be useful to develop shorter mini-clips on individual topics for quicker classroom use, and to more closely integrate the individual activity sheets into the games and videos.

Parent feedback

Parents also positively received the games and video-based approach of Wondermind. In particular, they liked the enjoyment, competition, and challenge aspects of the games. One parent suggested that it would be enjoyable to integrate high scores into the games in order to enhance these aspects.

The [Garden] card game... is a great memory game... and the [Hedge Maze] mirror game is very good... because you're having to really think about where you position things.

Parent

Anything that involves a score is a good thing because you get a bit of competitiveness going.

Parent

One parent also praised the style of the videos, particularly the use of two presenters, rather than one, as this format is more engaging to pupils.

[Having two presenters] makes it feel more like a conversation and less like a lecture.

Parent

However, one parent believed that the site becomes disengaging over time – activities lose their replay value after all of the games and videos have been sufficiently explored. This respondent felt the videos were too long and slowly paced. Again, they argued that there needs to be more animations or characters to be engaging to young pupils.

The games are fantastic – I thought you could learn a lot from that... but I'm wondering whether everyone [would find the videos interesting]... I think if it had been an animation of exactly what they were saying, I think would have gone better.

Parent

This respondent also argued that children could play the games without watching the videos, thereby sidestepping the primary educational content. They suggested that videos should be used to unlock more challenges or levels in the games themselves, or they could serve as a means progression through the games, whereby completing a video opens a new game.

One parent also argued that it was difficult to understand some of the instructions to the games, making it a challenge to succeed without a great deal of trial and error. This respondent noted that even they found the games, particularly the Hedge Maze, to be quite challenging.

Maybe if they had had a demonstration [it would have been easier for me to understand].

Parent

Ultimately, both parents felt there should be more content developed for the site, with clear explanations and an engaging presentation.

Nevertheless, the games and video approach was generally seen to be an effective, engaging method for teaching unfamiliar topics to pupils – both were seen to add value to the subject matter and make the concepts easier to understand, particularly within the classroom.

Impacts

Respondents, particularly teachers, were next asked to consider the impact Wondermind has on pupils. In general, these individuals believed that the site had an impact on their pupils, including achieving learning objectives and increasing engagement with science topics.

Teacher feedback

Both teachers strongly believed that their pupils were engaged with the resource and learned something during the lesson. Perhaps most significantly, both teachers highlighted that their pupils received a different

perspective or method of presentation from their ordinary lessons, and they felt this would have a more significant impact. Both agreed that Wondermind made their pupils more engaged with the subject matter despite their limited knowledge of neuroscience, noting that the site encouraged introspection and reflection on unfamiliar issues.

It makes them think of things that they never would have thought of, like how their brain works... it makes them aware that we all look at things differently -- and for a lot of them, it's quite revealing.

Teacher

[It gets them reflecting] on how their body is working and that things don't just happen. A lot more science skills. Those types of things they never would have thought about before.

Teacher

Both teachers also agreed that their pupils would be more engaged with ICT as the site is suited for individual PC use, and it is well designed, compared to a variety of others commonly used in the classroom. Both believed the pupils would be more engaged with the relevant subject areas more generally, particularly science but art as well, as the games are engaging and the site can be used for later home use.

Children respond to games, and when you've got that there and you've got them hooked, you may as well tell them why they're playing the game and the skills they're using.

Teacher

Both teachers also indicated that their pupils had likely developed a stronger link between learning and play as the games can be viewed as a reward for learning and participation. However, one teacher argued that to develop this link further, more games would be required.

If they wanted to really make something of [the link between learning and play], they would need more games. But it does [make the link; for example,] with the card game, [the pupils] realised [the game is] calling on their memory, and for a lot of children, that would be a really helpful activity actually.

Teacher

Survey respondents largely shared these sentiments; these respondents agreed with the idea that using sites like Wondermind to teach science topics through art and literature is more effective than traditional methods. Survey respondents also felt that their pupils had achieved a variety of learning outcomes following use of Wondermind. For example, they believed their pupils were more engaged with science generally, more knowledgeable about the parts and development of the brain, more engaged with ICT equipment in the classroom, and felt a stronger link between play activities and learning. One of the respondents also believed their pupils were more engaged with

neuroscience topics, more engaged with art generally, and more knowledgeable about memory specifically.

Parent feedback

The parents interviewed had fewer views regarding impacts of Wondermind on their children. However, one parent felt that the games do make the subject matter more interesting, but the length and presentation of the videos makes conveying the subject matter more challenging overall.

4.3.3 Comparisons to Other Resources

This section discusses how respondents compared Wondermind to similar resources they have used in class or at home. Despite the concerns highlighted in prior sections, respondents compared Wondermind very favourably to other resources and websites.

Teacher feedback

One teacher found that Wondermind was very positive compared to a number of other resources, noting that while the site requires fuller development, it is very strong for pupils and is very well designed.

Quite like that it dwelled on concepts for a while and it brought in other people who were experts that explained issues in a child friendly way.

Teacher

Similarly, another teacher believed that Wondermind conveys complicated material in a straightforward manner, and their pupils responded well to the presentation.

I think that the children did a really good job, even though it's a more complicated subject than they've ever covered before, so that's really good.

Teacher

Among the two survey respondents, one felt that Wondermind was of similar quality as other websites covering neuroscience topics, but there was a sense that this had not been a subject that had been covered in much detail before.

Parent feedback

One parent also compared Wondermind to other sites less favourably. This respondent noted that they have used other resources, such as the BBC, with their child, and has found that these sites generally have more content, leading to more lasting use. Furthermore, other sites tend to have clear links to curriculum, facilitating a stronger connection between home and classroom study.

It's quite limited, what you can do with it [compared to other sites].

Parent

This parent also believed it would be useful to have a multiplayer element that encourages competition between children in different locations. This would

enhance engagement and likely support future use of the site, as making the site more interactive would allow Wondermind to compete with other games offers outside of the classroom. Moreover, harnessing the competition element would likely make the site more appealing to use with more competitive pupils. However, this parent noted that such an option should not include chat functionality as this can be dangerous for children.

4.3.4 Future Use of Wondermind

This section covers respondents' views regarding whether or not they would use Wondermind again in the future, and how they would use the site differently, if at all. All respondents indicated that they would likely use Wondermind in the future.

Teacher feedback

Teachers were particularly likely to suggest they would use the site again; for example, survey respondents agreed that they would use the site in the future, and rated their experience with Wondermind a 4 on a five point scale. Respondents believed they would use the site again as independent student work in class, while one respondent indicated they would use the site as a starter activity, a plenary, throughout the lesson, and as homework as well.

These sentiments were echoed by teachers during case study interviews. The teachers suggested they would likely integrate use of Wondermind into a larger science unit or lesson, such as parts of the body, or using the site in an art lesson discussing art topics, or Alice in Wonderland more generally, particularly if there is more development. One respondent noted they would likely seek out artwork from the Alice in Wonderland exhibition at Tate Liverpool, as well as other videos and text related to the story.

I would use the stuff about how the brain works in a unit about learning about ourselves and our bodies, and I would probably get 2, possibly 3 lessons out of it. And there is definite uses linking it to artists and how they perceive the world... but that needs more development, I think.

Teacher

One teacher believed Wondermind could also be used to develop more generic thinking and reasoning skills.

For thinking skills activities, I probably would use this site... it would be a no-brainer for me now, and it would get the children thinking, it would get their brains working, it would get them up and about and moving, and get them motivated and excited.

Teacher

The two teachers had different ideas of how the site could be used in class in the future, ranging from whole lesson use in front of the entire class to use as a short activity with small groups. Planning would likely depend upon how the overall topic was structured and the time available to review the site in class. Indeed, one survey respondent who had not already used Wondermind indicated this was because they did not have enough available time. Both

case study teachers suggested that the length of the videos restricts their use outside of a large activity – having short videos and smaller groups of information would be useful to spread out use of the site.

I think I would mostly use this as an opportunity for thinking skills, first thing in the morning, for maybe 20 minutes as the kids are coming into class before lessons start.

Teacher

It would be good if you were doing it as a topic and you used the resource over a couple of weeks. Then, the games and some of the activities... they could be good starters and plenaries... but the videos would have to be [a] main [part of the lesson] because of their length and the concepts [explored].

Teacher

In addition, 71% of all survey respondents said they would be interested in receiving additional information about Wondermind, indicating that the proposition of Wondermind is attractive even to teachers that have not used or experienced the site.

Surveyed teachers believed they would recommend the site to a colleague, particularly if the site is developed further, taking account of the concerns noted above.

It's got its place, definitely, but if it wants to establish itself, it needs to add a few more things basically, just grow the site a bit more.

Teacher

Parent feedback

Families also suggested they would use the site in the future, though admitted they would likely spend the majority of their time playing the games. The children noted they would like to explore the games further and try to improve their performance. Meanwhile, as noted above, both parents believed they would explore the videos as a further education tool.

I would go on it again... [The content] sounded interesting.

Parent

Moreover, one parent felt Tate could expand the site's model to cover other subjects, thereby expanding the appeal of the concept more generally.

5. Conclusions and Recommendations

Conclusions

The findings indicate that respondents viewed Wondermind positively after using the site – respondents believed that Wondermind was interesting and well designed, and that it compares favourably to other online resources. Indeed, the findings suggest that Wondermind has value as a resource for teaching and learning. All respondents believed that their pupils had learned about neuroscience as a result of using the resource, and many adult respondents indicated their knowledge had increased as well. Additionally, observations and short conversations with pupils suggested that their knowledge of the topic had increased. Respondents generally agreed that using sites like Wondermind to teach science topics through art and literature is more effective than traditional methods.

However, respondents also highlighted a number of areas of the site that they felt could be improved. They contended that Wondermind has significant issues regarding usability, particularly in the classroom; the long length of the videos; and the assumption that there would not be new videos, games, or activities. These issues suggest that lasting use of Wondermind may be potentially limited.

The survey and case study interviews suggested that teachers and pupils are generally unfamiliar with the topic of neuroscience. However, both groups indicated that they were interested in the subject on a general level and enjoyed learning more about the topic. Respondents also generally believed that Wondermind was an effective tool for introducing neuroscience to non-scientific audiences as it presents the information in a fun and engaging manner.

While awareness of Wondermind within the sample was generally low, the findings indicate that Wondermind has strong potential to improve knowledge and understanding of neuroscience topics in an engaging and enjoyable format. Moreover, Wondermind is clearly able to generate new interest in the subject of neuroscience, making a challenging topic approachable to a variety of users, even outside the KS2 target audience.

In addition, respondents, particularly teachers, felt that the site had a positive impact on children – perhaps most significantly, they believed their pupils learned about a new topic in an interesting and engaging way. Though neuroscience was largely a new topic to respondents, they suggested that the subject matter of Wondermind was very interesting, and that the pupils responded well to the concepts. Specifically, the games and videos on the

site, as well as the inclusion of experts, contributed to the overall high value of Wondermind compared to similar resources.

Respondents also shared a number of positive views about the user experience of Wondermind. For example, respondents believed the site was well designed and attractive, evoking the image of Tate to express their favourable views. The Tate brand was very highly regarded amongst respondents, and Tate's connection to Wondermind lent some degree of credibility to the site. The high design quality of the site contributes strongly to the perception that Wondermind is an effective and reliable resource.

Many also felt that the online format is a natural choice for Wondermind given overall trends in educational resource development. Finally, many praised the games and videos found on Wondermind, finding them to be well designed, engaging, and enjoyable. Classroom observations in particular suggested that the design, format, and features of the site make Wondermind a versatile and useful tool for educating KS2 pupils.

However, the most important issues with the site concerned the usability of Wondermind, such as the lack of clear curriculum links, challenges regarding the cohesion and navigability of secondary materials on the site, or the length of the videos. Many respondents also believed the site has little long-term value as there is seemingly no development of new games or videos. Without addressing these user experience issues, usage of Wondermind is limited, posing challenges for other key objectives of the site going forward, namely making neuroscience content accessible to new audiences and improving their understanding of the subject.

Despite the concerns listed above, all respondents believed they would use the site in the future, posing a number of possible options for later use. It is important to capitalise upon these views by ensuring the user experience is responsive and the quality of design is maintained. Furthermore, Wondermind could be supported by on-going development of new content in order to engender sustained interest from target audiences and attract new users.

Recommendations

Overall, the evaluation has indicated that Wondermind has been effective in achieving its objectives amongst audiences that have used it. However, apparent low awareness of the site would suggest that its reach has not been as wide as intended. We would therefore put forward some key recommendations for the future development of Wondermind designed to increase awareness and recognition to help the site better meet its overall objectives:

- Re-evaluate the marketing strategy toward KS2 teachers and families in order to increase awareness and drive site traffic.
- Consider adding on-going new content to the site, including new games and short mini-clip videos. These additions would not only create new engagement with the site, particularly at home, it would

facilitate usage of the site in different classroom environments and allow teachers to structure new lessons.

- Establish more explicit links to the curriculum to enhance the utility and credibility of Wondermind and to facilitate teacher lesson planning and pupil home use.
- Develop additional lesson plans and guidance for teachers to use the site in class, and make these materials clearer on the site.
- Link the site's content more closely to art, leveraging Tate resources and branding, as both were viewed very highly by respondents. In addition, consider developing art-oriented videos, or tying the science content to art topics more explicitly.
- Consider more visible links to the Wellcome Trust to validate the scientific focus of the site more explicitly.
- Consider adding multi-user options to games to introduce a new competitive element, and consider adding animation and characters to videos. These features would likely boost pupil engagement with the site.
- Improve connections to Alice in Wonderland by providing more story background and KS2 level content, such as short video clips or animated features.

6. Appendix: Survey Questionnaire

The Respondent and their School

Q1. What level of education do you teach? Please select all that apply.

- Early Years
- Key Stage 1
- Key Stage 2
- Key Stage 3
- Key Stage 4
- Post-16
- Other

TERMINATE RESPONDENTS THAT DO NOT CHOOSE KS2, BUT ALLOW MULTIPLE

Q2. Do you teach any of the following topics, collectively known as neuroscience, within any of your subject areas? Please select all that apply.

- Parts of the brain
- Development of the brain
- Memory
- Speech and language
- Emotions
- Learning and recognition
- None of these, but I am interested in these topics
- None of these
- Don't know

The Respondent and Neuroscience

Q3. How knowledgeable would you say you are about the topic of neuroscience (i.e. any of the topics mentioned in the previous question) generally?

- 5 - Very knowledgeable
- 4
- 3
- 2
- 1 - Very unknowledgeable
- Don't know

Q4. How comfortable would you say you are about teaching neuroscience to your students?

- 5 - Very comfortable
- 4
- 3
- 2
- 1 - Very uncomfortable
- Don't know

Wondermind

Thank you very much. The topics in the previous question will be collectively called 'neuroscience' for the remainder of this questionnaire.

We will now examine your awareness of and experiences with Wondermind, a free website for teaching about neurological development for KS2 pupils. Wondermind was developed by the Tate with support from the Wellcome Trust.

Q5. Have you heard of Wondermind (<http://wondermind.tate.org.uk/>) before?

- Yes
- No
- Don't know

IF YES AT Q5

Q6. Where have you heard of Wondermind? Please select all that apply.

- Received marketing email
- Received marketing letter
- Tate social media accounts (e.g. Facebook, Twitter)
- Attended Alice in Wonderland exhibition at the Tate Liverpool, hosted from November 2011 to January 2012
- Saw an advertisement in another Tate gallery
- From another teacher
- From member of school's SLT
- From a friend or family member
- Other (please specify)
- Don't know

Q7. Did you visit the Alice in Wonderland exhibition at the Tate Liverpool at all, either on your own time or as part of a school trip?

- Yes, on my own time
- Yes, as part of a school trip
- No
- Don't know

IF YES AT Q5

Q8. Have you used Wondermind with your students?

- Yes
- No (send to Q22)
- Don't know (send to Q25)

IF YES AT Q8

Q9. Why did you decide to use Wondermind with your students? Please select all that apply.

- It is a strong resource for teaching topics related to neuroscience
- I liked the look and feel of the site
- It is easy to use
- I like to use cross-curricular resources
- I liked the links to Alice in Wonderland
- My students like computer-based resources
- I liked the games-based approach to teaching about science
- I liked the interactive video approach to teaching about science
- It made complex concepts easy to understand
- It was recommended by a colleague/ friend
- It was well suited to the age of my pupils
- It was something different to do in class
- It linked clearly with the curriculum
- Other (please specify)
- Don't know

IF YES AT Q8

Q10. Which sections of the Wondermind website did you use in class? Please select all that apply.

- The Hedge Maze game
- The Garden game
- The Tea Party game
- The Forest game
- Videos about the parts and development of the brain
- Videos about memory
- Videos about learning and recognition
- Videos about speech and language
- The Wondermind blog
- Don't know

IF YES AT Q8

Q11. When have you used the Wondermind website? Please select all that apply.

- Start of lesson (starter activity)
- End of lesson (plenary)
- Throughout lesson
- Independent student use
- Assigned as homework
- Other (please specify)
- Don't know

IF YES AT Q8; ONLY PIPE THROUGH CODES CHOSEN FROM Q10

Q12. Please rank the three sections of the Wondermind site that your students most enjoyed, where 1 is highest and 3 is lowest.

- The Hedge Maze game

- The Garden game
- The Tea Party game
- The Forest game
- Videos about the parts and development of the brain
- Videos about memory
- Videos about learning and recognition
- Videos about speech and language
- The Wondermind blog
- Don't know

IF YES AT Q8

Q13. On a scale of 1-5, how much would you say your students enjoyed Wondermind?

- 5 – enjoyed a lot
- 4
- 3
- 2
- 1 – did not enjoy at all
- Don't know

IF YES AT Q8

Q14. What learning outcomes did your pupils achieve following using the Wondermind website? Please select all that apply.

- More engaged with the topics relating to neuroscience (i.e. memory, emotions, parts of the brain, etc.)
- More knowledgeable about the parts and development of the brain
- More knowledgeable about memory
- More knowledgeable about learning and recognition
- More knowledgeable about speech and language
- More engaged with ICT equipment in the classroom
- Stronger link between play activities and learning
- More engaged with Science generally
- More engaged with Art generally
- Other (please specify)
- None of these
- Don't know

IF YES AT Q8

Q15. Would you use the Wondermind site again with your pupils?

- Yes
- No
- Don't know

IF YES AT Q8 AND IF YES AT Q15

Q16. How would you use the Wondermind site in the future?

- Start of lesson (starter activity)
- End of lesson (plenary)
- Throughout lesson

- Independent student use
- Assigned as homework
- Other (please specify)
- Don't know

IF YES AT Q8 AND NO AT Q15

Q17. Why do you believe you would not use the Wondermind site again with your pupils?

- Not enough available time
- The website is not suitable for my pupils
- Lack of clear curriculum links
- Learning outcomes unclear
- Lack of student engagement with the site
- Difficult to access the website
- Difficult to use in offline setting
- Activities too inflexible
- I didn't like the links with Alice in Wonderland
- Not relevant to the age of pupils I teach
- Other resources are better
- Other (please specify)
- Don't know

IF YES AT Q8

Q18. How does Wondermind compare to similar websites you have used covering these topics? Wondermind is...

- A lot better
- A little better
- About the same
- A little worse
- A lot worse
- Don't know
- I have not used any similar websites

IF ANY OPTION OTHER THAN 'SAME,' 'DON'T KNOW,' OR 'I HAVE NOT USED' CHOSEN AT Q18

Q19. Why do you believe Wondermind is <pipe through Q18 answer> than similar websites you have used covering these topics?

OPEN

IF YES AT Q8

Q20. To what extent do you agree with the statement: "Using sites like Wondermind to teach science topics through art and literature is more effective than traditional methods."

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

- Don't know

IF YES AT Q8

Q21. Overall, on a scale from 1-5, how would you rate your experience using Wondermind?

- 5 – excellent
- 4
- 3
- 2
- 1 – very poor
- Don't know

IF NO AT Q8

Q22. Why have you not used Wondermind? Please select all that apply.

- Not enough available time
- The website is not suitable for my pupils
- Lack of clear curriculum links
- Learning outcomes unclear
- Lack of student engagement with the site
- Difficult to access the website
- Difficult to use in offline setting
- Activities too inflexible
- I don't like the links with Alice in Wonderland
- Not relevant to the age of pupils I teach
- Other resources are better
- Other (please specify)
- Don't know

IF NO AT Q8

Q23. Do you plan to use the Wondermind site with your pupils in the future?

- Yes
- No
- Don't know

IF YES AT Q23

Q24. When do you plan to use Wondermind?

- This term
- Next term
- Next academic year
- In the next couple of years
- Don't know

Their Pupils and Neuroscience

Q25. How knowledgeable would you say your students are about neuroscience (i.e. memory, emotions, parts of the brain, etc.)?

- 5 – very knowledgeable
- 4

- 3
- 2
- 1 – very unknowledgeable
- Don't know

Q26. On a scale of 1 to 5, how interested are your students in neuroscience (i.e. memory, emotions, parts of the brain, etc.)?

- 5 – very engaged
- 4
- 3
- 2
- 1 – very unengaged
- Don't know

Resources for Teaching Neuroscience

Q27. What resources have you used to teach neuroscience, if any?

- TES
- BBC
- Brain Cells
- Twig
- National STEM Centre
- Young Minds in Schools
- Promethean Planet
- Other (please specify)
- None of these
- Don't know

FOR EACH RESOURCE SELECTED AT Q27

Q28. How would you rate your experience using <resource>?

- 5 – excellent
- 4
- 3
- 2
- 1 – very poor
- Don't know

Closing

Q29. Would you like to add any further views concerning Wondermind?

OPEN

Q30. Would you be interested in receiving additional information about Wondermind?

- Yes
- No
- Don't know

Thank you for participating in this survey! As a token of our appreciation, we would like to enter you into a prize draw to win one of two £50 prizes! If you would like to enter the prize draw, please enter your details here:

- Name
- Email

Would you be willing to take part in future research on this project?

- Yes
- No

7. Appendix: Teacher Case Study Discussion Guide

Timing	Discussion topics / prompts
0- 5 mins	Background/Warm Up <ul style="list-style-type: none"> • Purpose of research: EdComs is working on behalf of the Tate to evaluate Wondermind, an online resource developed in partnership with the Wellcome Trust to teach neuroscience topics (such as memory, learning, and parts of the brain) to pupils at KS2. • Recording interview and confidentiality/MRS code of ethics • Can you give me a little bit of background to the school and your role/responsibilities? <ul style="list-style-type: none"> ○ Student demographics
5 – 7 mins	Teaching Experience <p>What topics do you normally cover in Science?</p> <ul style="list-style-type: none"> • Is neuroscience or brain development something you have covered before? <ul style="list-style-type: none"> ○ IF YES: What topics did you cover? What was your experience like? ○ IF YES: what resources have you used to teach this topic? Probe few examples below <ul style="list-style-type: none"> ▪ TES ▪ BBC ▪ Brain Cells ▪ Twig ▪ National STEM Centre ▪ Young Minds in Schools ▪ Promethean Planet ○ Why did you use those resources? What benefits do they have? <p>How knowledgeable would you say you are about the topic of neuroscience generally?</p> <ul style="list-style-type: none"> • What about your students? How engaged are they with the topic?
7-10 mins	Reasons for Using Wondermind
	IF USED BEFORE: Where did you hear of Wondermind? <ul style="list-style-type: none"> • (if in the Liverpool area) Did you attend the Alice in Wonderland

	<p>exhibition at the Tate Liverpool?</p> <p>IF USED BEFORE: How many times have you used Wondermind?</p> <ul style="list-style-type: none"> • IF USED MORE THAN ONCE: Why did you decide to use Wondermind again? What about it was appealing? <p>IF USED BEFORE: Why did you decide to use Wondermind? What attracted you to the resource?</p> <ul style="list-style-type: none"> ○ What did you hope to get out of using the resource? ○ How did you expect your experiences with Wondermind would go? <p>IF NOT USED BEFORE: Before this session, was there anything in particular that you were hoping to get out of using the resource? Did you have any expectations?</p>
<p>10-15 mins</p>	<p>Experience of the Lesson</p>
	<p>Tell me about your experience with Wondermind. How did this lesson go for you?</p> <p>What was the best part of the lesson for your students? What was more enjoyable or engaging?</p> <ul style="list-style-type: none"> ○ What role did Wondermind play in that feeling? <p>What was the worst part of the lesson for your students? What was least enjoyable or engaging?</p> <p>Any surprises for you in running the lesson? Did the students have any surprising reactions? Did anything go better or less well than planned?</p>
<p>15-25 mins</p>	<p>Experience of Wondermind</p>
	<p>What do you think of Wondermind generally? (IF APPLICABLE:) Would you say your expectations of the site have been met?</p> <p>What works particularly well about Wondermind? Why?</p> <ul style="list-style-type: none"> • Probes: <ul style="list-style-type: none"> ○ How does the subject matter work? How well does Wondermind link to the curriculum? ○ What do you think of the look and feel? What about the links to Alice in Wonderland? Are these links useful? <ul style="list-style-type: none"> ▪ Does linking the science to art and literature have any greater impact for your students? ○ What about the online, computer-based focus of Wondermind? ○ What about the site's games and video-based approach?

	<p>What does not work well about Wondermind? Why?</p> <p>How easy is it to use Wondermind in class and prepare for lessons? What is the best time to use the resource?</p> <p>What impact do you think Wondermind has had on your students? Do you think they learned much from the resource?</p> <ul style="list-style-type: none"> • Probe: <ul style="list-style-type: none"> ○ More engaged with subject matter ○ More engaged with ICT ○ More engaged with Science/Art in general ○ Stronger link between learning and play <p>Do the game-based approach and look and feel of Wondermind make learning neuroscience more enjoyable or engaging?</p> <p>How would you improve Wondermind?</p> <ul style="list-style-type: none"> • For teachers? • For pupils?
<p>25-30 mins</p>	<p>Comparisons with Other Sites and Future Use</p>
	<p>How does Wondermind compare to other resources you have used to teach neuroscience topics (or to teach Science/Art topics)? Why do you say that?</p> <p>Would you use Wondermind in the future? How and why?</p> <ul style="list-style-type: none"> • In what ways would it be different from how you used it today? • Would Wondermind be a core part of another lesson, if applicable, or only a minor aspect? • What resources or lessons would you use Wondermind with in the future? <p>Would you recommend Wondermind to a colleague or friend?</p> <p>Do you have any additional thoughts about Wondermind?</p>
	<p>Sum up, thank and close</p>

8. Appendix: Family Case Study Discussion Guide

Timing	Discussion topics / prompts
0-3 mins	Background/Warm Up
	<ul style="list-style-type: none"> • Purpose of research: EdComs is working on behalf of the Tate to evaluate Wondermind, an online resource developed in partnership with the Wellcome Trust to teach neuroscience topics (such as memory, learning, and parts of the brain) to pupils at KS2. • Recording interview and confidentiality/consent/MRS code of ethics • (TO CHILD) Would you please give me a little bit of your background? <ul style="list-style-type: none"> ○ Age, interests, normal computer usage
3-7 mins	Learning Experiences in School and Home
	<p>(TO CHILD) What subjects are you most interested in?</p> <ul style="list-style-type: none"> • IF SCI/ART NOT MENTIONED are you interested in science or art? <ul style="list-style-type: none"> ○ Have you ever covered neuroscience or brain development in school? <ul style="list-style-type: none"> ▪ IF YES: What do you think of these topics? Are they interesting to you at all? • TO BOTH: Do you often spend time together on the computer?
7-10 mins	Reasons for Using Wondermind
	<p>IF USED BEFORE: Where did you both hear of Wondermind?</p> <ul style="list-style-type: none"> • (if in the Liverpool area) Did you attend the Alice in Wonderland exhibition at the Tate Liverpool? <p>IF USED BEFORE: How many times have you used Wondermind?</p> <ul style="list-style-type: none"> • Separately? Together? <p>IF USED BEFORE: TO CHILD: Why did you want to use Wondermind?</p> <ul style="list-style-type: none"> • TO PARENT: <ul style="list-style-type: none"> ○ What did you hope to get out of using the site? ○ How did you expect your experiences with Wondermind would go? <p>IF NOT USED BEFORE:</p>

	<ul style="list-style-type: none"> • TO PARENT: Before this session, was there anything in particular that you were hoping to get out of using the resource? Did you have any expectations?
<p>10-15 mins</p>	<p>Experience of the Session</p>
	<p>This section mostly for child, but parent should be included.</p> <p>Tell me about your experience with Wondermind. What was it like to use?</p> <p>What was the best part of the site? What was the most fun?</p> <p>What was the worst part of the site? What was least fun?</p> <p>IF NOT USED BEFORE: Any surprises for you in using the site? Did your child have any surprising reactions?</p>
<p>15-25 mins</p>	<p>Experience of Wondermind</p>
	<p>This section mostly for parent, but child should be included.</p> <p>What do you think of Wondermind generally? (IF APPLICABLE:) Would you say your expectations of the site have been met?</p> <p>What works particularly well about Wondermind? Why?</p> <ul style="list-style-type: none"> • Probes: <ul style="list-style-type: none"> ○ How does the subject matter work? ○ What do you think of the look and feel? What about the links to Alice in Wonderland? Are these links useful? ○ What about the online, computer-based focus of Wondermind? ○ What about the site's games and video-based approach? <p>What does not work well about Wondermind? Why?</p> <p>IF USED BEFORE: How would you or your child normally use the site?</p> <ul style="list-style-type: none"> • What time? • With any other members of the family or friends? • With any other websites or other resources? <p>IF USED BEFORE: What impact do you think Wondermind has had on your child? Do you think they have learned much from the resource?</p> <ul style="list-style-type: none"> • Probe: <ul style="list-style-type: none"> ○ Would they be more engaged with subject matter? ○ Would they be more engaged with ICT? ○ Would they be more engaged with Science/Art in general? ○ Stronger link between learning and play?

	Do the game-based approach and look and feel of Wondermind make learning the subject matter more engaging ?
25-30 mins	Comparisons with Other Sites and Future Use
	<p>TO PARENT: How would you improve Wondermind?</p> <p>TO CHILD: What would make Wondermind more fun?</p> <p>TO PARENT: How does Wondermind compare to other websites you both have used at home? Why do you say that?</p> <p>TO PARENT: Would you use Wondermind in the future? How and why?</p> <ul style="list-style-type: none"> • In what ways would it be different from how you used it today? • What would you hope to get out of with continued use of Wondermind? <ul style="list-style-type: none"> ○ Probe: <ul style="list-style-type: none"> ▪ Child more engaged with subject matter ▪ Child more engaged with ICT ▪ Child more engaged with Science/Art in general ▪ Stronger link between learning and play for the child <p>Would you recommend Wondermind to a friend?</p> <p>Do you have any additional thoughts about Wondermind?</p>
	Sum up, thank and close

9. Appendix: Tate Liverpool Exhibition Discussion Guide

Timing	Discussion topics / prompts
0 - 1 mins	Background/Warm Up
	<ul style="list-style-type: none"> • Purpose of research: Feedback in relation to the Wondermind exhibition at the Tate Liverpool • Recording interview and confidentiality/MRS code of ethics • Ask age, home location; demographics of child/children (age/gender/ethnicity)
2 - 3 mins	Hearing about the Exhibition
	<ul style="list-style-type: none"> • How did you hear about the exhibition? What did you hear about it before attending? • Why did you decide to attend the exhibition? What were you expecting?
3 - 6 mins	Views on the Exhibition – only ask if have time but focus on the website
	<p>For parents/responsible adults:</p> <ul style="list-style-type: none"> • Was the exhibition what you expected? <ul style="list-style-type: none"> ○ If so, in what way? ○ If not, why not? • How interested were your children in what they saw? • What do you think are the best/ worst exhibits? <p>For children aged 7-11:</p> <ul style="list-style-type: none"> • Why did you want to come to the exhibition? • What did you think of the things you have seen today? • What was the best thing about today? What was so good about it? (ask child to show you their favourite thing in the exhibition and say why they liked it most) • What was the worst? What did you not like about it? (ask child to show you their least favourite thing in the exhibition and explain why they liked it least)

6 - 10 mins	Views on the Wondermind Experience Website
	<p>For parents/responsible adults:</p> <ul style="list-style-type: none"> • Are you aware of the Wondermind experience website? • Did you use the Wondermind experience website during your visit today? <ul style="list-style-type: none"> ○ If so, how long did you spend? ○ What did you think of it? • How likely are you to visit the Wondermind website with your children on your own time? • What do you think your children learned from using the website, if anything? <ul style="list-style-type: none"> ○ Are you likely to follow up on anything your children have learned? ○ Will what you have learned change your/ their approach to anything at home, school, etc.? • Are your children interested in science generally? <ul style="list-style-type: none"> ○ Are your children more interested in science after using the website? <p>For children aged 7-11:</p> <ul style="list-style-type: none"> • Did you use the Wondermind website on the computers inside? If so, what did you think? • Did you learn anything from the Wondermind website? • Are you interested in science at school? • (Using the subject matter mentioned in previous two questions) Did the exhibition make you any more interested in these topics? Will you read about them at home or with your parents? Do you think you will tell your friends at school/ teachers about it? Why/why not? • Will you look at the Wondermind website at home? What do you think would be on the website?
10 mins	Sum up, thank and close
	<ul style="list-style-type: none"> • Are you interested in participating in future research with EdComs?