The activities are:

1. Evaluating the (re)construction of gendered representations of characters in TV programmes
2. Rewarding healthy viewing strategies
3. A focus on media literacy skills
4. Making explicit the purpose of creating TV programmes
5. Visible Witnesses
6. Invisible Witnesses
7. Outcomes for students
8. Outcomes for the school
9. Use in the classroom
10. Feedback from facilitator on winning TV series

Invisible Witnesses

Drawing on young people’s media literacy skills to explore gendered representations of science, technology, engineering and mathematics

For over 30 years researchers have been trying to understand how children and young people make sense of science and technology programmes and representations in media. Invisible Witnesses is the study which set out to address this lacuna by examining children’s and young people’s experiences of TV extracts about science. The project explored how children and young people conceptualise science and technology in the context of TV programmes. To examine how children and young people conceptualise science and technology in the context of TV programmes.

Outcomes for students:

- Participants use certain indicators (e.g. body language, how they speak to each other) which can impact on how they see themselves as scientists.
- Participants use these indicators to encourage peers to engage with the activity.

Outcomes for the school:

- Outcomes for the school include the impact on the school about the voices and the expectations that the students have about STEM. This may highlight areas for the school.
- For over 30 years researchers have been trying to understand how children and young people make sense of science and technology programmes and representations in media. Invisible Witnesses is the study which set out to address this lacuna by examining children’s and young people’s experiences of TV extracts about science. The project explored how children and young people conceptualise science and technology in the context of TV programmes. To examine how children and young people conceptualise science and technology in the context of TV programmes.

The methods used within the studies have been designed to work with, and capitalise on, the participants’ media literacy skills. The focus on the role of television as a powerful medium enables us to engage young people in an activity that is relevant to them. By engaging young people in an activity that is relevant to them, we can gain insights into how they engage with science and technology programmes and representations in media.
The activities include:

- A focus on media literacy skills provides opportunities for developing young people’s critical thinking about the images they see. This forms an integral part of the invisibility agenda.
- Children and young people have very little exposure to representations of maths and so may not think about engaging with this area in school about the values and expectations that students have about STEM. This may highlight areas for the school to address.
- Outcomes for students: Making explicit the purpose of creating media. A new agenda for STEM is being developed by the European Union. This agenda includes one area for activity that is sector-focused. The project researchers are: Elizabeth Whitelegg; Dr Jenni Carr and Dr Richard Holliman; Dr Arslan Zargar (Institute of Education, University of London) and Dr Arslan Zargar (Institute of Education, University of London).

Invisible Witnesses

Drawing on young people’s media literacy skills to explore reconfigured representations of science, technology, engineering and mathematics

For over 30 years researchers have been trying to understand what can be done to make science, technology, engineering and mathematics (STEM) more interesting to young people. This problem is critical because of the shortage of qualified STEM experts, and there have been difficulties identifying effective ways to address their needs. In their reflective writing about their future selves as scientists, young people are asked to consider representations of STEM and how stereotypes and their purposes. Young people are able to deconstruct stereotypes and to propose alternative representations of STEM as ones that they could espouse for themselves. The images of STEM that some girls experience are stereotypically masculine images of science and mathematicians (STEM) are constructed. We have argued that this process of (re)construction of gendered representations of STEM on children’s television and film is an area of serious concern. Much of this work has been inspired by the work of Ian E. James and colleagues. The project researchers are: Elizabeth Whitelegg; Dr Jenni Carr and Dr Richard Holliman; Dr Arslan Zargar (Institute of Education, University of London) and Dr Arslan Zargar (Institute of Education, University of London).

We have argued that the process of interpreting images plays an important role in the ways in which children and young people actively construct their own media and representations of STEM.

How do young people engage with the invisibility agenda?

A key priority that has been identified through the Invisible Witnesses project is to explore the ways in which young people do not simply passive receivers of media, but active interpreters of media representations.
Do you know a Scientist or Engineer?

We asked the participants to draw a scientist or engineer. Only seven drawings were of female scientists or engineers, compared with 39 drawings of male scientists and engineers. Only six of these drawings were identified as female. These findings are consistent with other recent research. It is often difficult to produce good drawings of girls, but very easy by boys.

What sort of scientist or engineer would you want to be?

Some participants wanted to be a scientist or engineer in order to help others. This could be because they thought it was important to make a lot of money in order to do this, or that it would give them a feeling of achievement when they had achieved something. The majority of participants said they were not interested in being a scientist or engineer. Some participants argued that if the scientist or engineer were not mad he would not be able to carry out an experiment that would go wrong really easily. They reasoned that this indicated that "science is not the mad scientist." Some participants argued that being "clever" or "geeky" and therefore good at STEM because "it's really complicated.

What do Scientists look like?

We asked the participants to draw a scientist or engineer. Only seven drawings were of female scientists or engineers, compared with 39 drawings of male scientists and engineers. Only six of these drawings were identified as female. These findings are consistent with other recent research. It is often difficult to produce good drawings of girls, but very easy by boys.

What kinds of representations of children and STEM do you think are important?

What do you do in your spare time? In order to see if the participants were interested in STEM, we asked them what they did. Some participants talked about doing science at home, or within the field of forensics. The majority of participants referred to the mechanical aspects to do with fixing things. Four participants in engineering again referred to the mechanical aspects of work that engineers might do. These age-related differences also highlight the understanding of the jobs that engineers do. This may reflect different experiences. Through interviews, it is evident that there is an emphasis on young people to be an engineer or do STEM. All groups included some level of interactive content, including links to social networking tools such as Facebook and Twitter, and the potential for programme-related websites to encourage the downloading of apps, games produced for hardware such as Microsoft X-Box. Some of the more sophisticated examples used interactivity to allow the participant to position themselves in the story and to encourage them to make a decision about their future. This proved an enriching mechanism to focus on the types of products that children and young people are exposed to and that would promote the potential for programme-related websites to be interactive. The participants did not, however, demonstrate a concern for the ethical sourcing of the products.

If you were going to promote the series through a programme-related website, what would you do?

They will give us learning about it and will have a better of outcome doing it in a lot happy way.
future for themselves working in STEM. This is in
the younger children who identified a possible
more girls (54%) than boys (38%) said STEM
more suitable for boys than girls. Interestingly,
diverse set of roles for engineering.
children and young people to imagine a more
those experienced through television, to enable
do, these age-related differences also highlight
understanding of the jobs that engineers might
of the types of work that engineers might
participants, however, used terms such as ‘design’
Slightly less than half of those who completed
Do you know a Scientist or
produced by girls, but very rarely by boys.
other recent large-scale ‘draw-a-scientist’ tests
that the girl was
of scientists were identified as drawings of males.
Only seven drawings were of female scientists
also highlighted
representations of careers in engineering.
the future scientists mentioned financial reward
on every case. It would also give you that
Thinking about promoting the series through a
They will give us learning about it and will have a better of teaching it if a
happy way.

What do Scientists look like?
We asked the participants to draw a scientist. The
of the image was a female scientist. Only seven
drawings were of female scientists and many
expressed an interest in becoming a female scientist.

What kind of people would you like to see?
The participants felt that in engineering it was
important to see people of colour and gender.
When asked to draw the ‘ideal’ scientist, very few
participants drew a ‘female’ one.

An extract where a female captain of a spaceship

What sorts of scientists or engineers would you
be interested in meeting?
We asked the participants to draw themselves
at work in a future role. 10% of the drawings
were identified as drawings of males. In
the drawings produced by girls, but very rarely by boys.

What kinds of representations of STEM and gender
do you think people would enjoy?
We asked the participants to work in groups to
interest in combining science, technology, engineering
and mathematics. The tables included providing
information about the series, such as showing the
participants’ own ideas for the type of programme,
including outdoor education, public engagement
and programme-related websites.

Merchandising and websites
All of the groups demonstrated a good understanding
of the content that programme-related websites might
contain. All groups included some level of interactive
cutting to links on social networking tools such as
Facebook and Twitter, and the content in
the potential for programme-related websites to
content, including links to social networking tools
such as Facebook and Twitter.

Promoting a series on the web:
Letter of recommendation
Each participant was given an imaginary TV
show, their work was presented in the form
of a letter to an imaginary TV producer.

The Range of supporting merchandise tended to
focus on the types of products that children and young
people are regularly exposed (e.g. T-shirts,
merchandising, and animated programmes.

Planning a TV series
Focusing on an appealing storyline that
would encourage the participants to think
about the personalities of the characters in
the programme and their relationship to
the programme. The participants felt
that alongside the programme being fun and
entertainment value of the programme they had
selected very highly, but they also commented
that the programme should also promote
a STEM career.

Correspondence science through an SMT which contained fact boxes
about science, maths, engineering and technology.
Participants felt it as important that the
‘ethical sourcing’ of the products.

Promoting a series on the web:

‘Teaching children new facts without the traditional teacher approach’

They will give us learning about it and will have a better of teaching it if a
happy way.
Do you know a Scientist or Engineer? 5

Catherine and her colleagues set out to find a scientist or engineer, even though these were lessons. As the primary aged children defined themselves as people who changed things, and working in laboratories and research centres, a 'scientist' was more than just a name or a job title. Unlike those aspiring to be engineers, the participants could offer up the conditions of what they thought the future scientists mentioned financial reward: ‘people who fix things’ (e.g. washing machines; cars; quad bikes; showers; tractors). The older participants have a more sophisticated understanding of the types of work that engineers might do, these age-related differences also highlight the importance of imagination and fantasy world creation for children and young people to imagine a more diverse and creative future for themselves. Children and young people who identified a possible role model was important for them. It was, however, mostly more girls (54%) than boys (38%) said STEM was more suitable for boys than girls. Interestingly, older participants had a more nuanced view of the stereotypes of science and scientists than the younger children who identified a possible role model. These findings are consistent with research suggesting that boys are more likely to have a more stereotypical understanding of what a ‘female’ role model might look like. An extract shows how a female captain of a spaceship was seen as a stereotypical female characteristic. Some participants argued that if the scientist was a ‘female’ one. Participants felt it as important that the programme could go wrong really easily’.

The participants felt that careers in engineering were ‘mad he would not be able to carry out the experiment (he turned in a monster) that made him mad? The participants did make use of stereotypes, for example, the ‘mad scientist’, in both game shows and written formats. Scientists: mad or genius? They reasoned that this indicated that ‘science can go wrong really easily’.

Science was seen in the role ‘problem solver’ (e.g. detective; judge). The four participants who imagined themselves working in: Laboratories and research centres; Offices; and hospitals. Of those who identified themselves as scientists, only seven drawings were of female scientists (the younger children who identified a possible role model. These findings are consistent with research suggesting that boys are more likely to have a more stereotypical understanding of what a ‘female’ role model might look like. The participants felt that careers in engineering were ‘mad he would not be able to carry out the experiment (he turned in a monster) that made him mad? The participants did make use of stereotypes, for example, the ‘mad scientist’, in both game shows and written formats. Scientists: mad or genius? They reasoned that this indicated that ‘science can go wrong really easily’.

Creating a television series for children and young people that will go on to be successful. We asked the participants to work in groups to plan a television series that they would like to see produced. The participants felt that careers in engineering were ‘mad he would not be able to carry out the experiment (he turned in a monster) that made him mad? The participants did make use of stereotypes, for example, the ‘mad scientist’, in both game shows and written formats. Scientists: mad or genius? They reasoned that this indicated that ‘science can go wrong really easily’.

What makes a drawing of a scientist or engineer? To understand what the participants wanted to see in a television series that they would like to see produced. The participants felt that careers in engineering were ‘mad he would not be able to carry out the experiment (he turned in a monster) that made him mad? The participants did make use of stereotypes, for example, the ‘mad scientist’, in both game shows and written formats. Scientists: mad or genius? They reasoned that this indicated that ‘science can go wrong really easily’.
Drawing of a gender neutral scientist

Keeping with other research findings suggesting future for themselves working in STEM. This is in the younger children who identified a possible was important for them. It was, however, mostly more girls (54%) than boys (38%) said STEM

The potential for other representations, such as participants, however, used terms such as ‘design’ cars; quad bikes; showers; tractors). The older

Do you know a Scientist or role models. These findings are consistent with this participant demonstrated a sophisticated androgynous figure with added notes implying that the young scientist being identified as gender neutral. Once again, all of these drawings

average, the drawings done by girls had fewer
drawings of males. Only eight of these were female. All

For those who identified themselves as scientists, they appeared to be engaged in science-related

On average, the drawings done by girls had fewer
drawings of males. Only eight of these were female. All

What do scientists look like?

What sort of scientist or engineer would you want to be? is an activity to encourage students to place themselves within the

What kind of representations of STEM and gender have these students encountered?

Creating a television series for children and young people that promotes STEM engagement

Merchandising and websites

All of the groups demonstrated a good understanding of the series’ targeted demographic

They will grow up learning about it and will have a better knowledge of it if learning it in a fun, happy way.

Promoting a series on the web

Planning a TV series

Focusing on stereotypical instructions about what to wear to look like a scientist or engineer can go wrong really easily”.

Participants felt it as important that the programme provided an opportunity to show the

Participants felt that careers in engineering

What do Scientists look like?

Participants felt that careers in engineering offered opportunities for ‘problem solving’, as participants

They reasoned that this indicated that “science

Participants referred to physical signifiers, including clothing (white lab coats and safety

A range of supporting merchandise tended to be used as a way of engaging the audience in

All of the groups demonstrated a good

Some of the more sophisticated examples used apps, games produced for hardware such as

Whilst the use of stereotypes may provide

The tasks included providing an overview of the technology, engineering and/or mathematics.

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What kind of representations of STEM and gender have these students encountered?
The activities aim to:
- Expose children and young people to representations of STEM
- Encourage the development of positive understandings of STEM
- Challenge stereotypes and representations

The activities include:
- "Draw-a-scientist" exercise
- "Invisible Witnesses" activities
- Feedback from facilitator on winning single episode to the rest of the class
- Class discussion led by facilitator about storyboarding one episode; storyboarding one episode;
- Reflective writing about working in STEM, 11 years; 8-10 years
- "Scottish young people's perceptions of STEM and their place within these fields in the future."

A key premise that has underpinned the Invisible Witnesses project is that children and young people are not simply passive receivers of media messages, but active viewers and 'interpreters of media representations'. (Adapted from Buckingham, 2005)

The Invisible Witnesses project therefore aimed to contribute to the educational environment alone. The invisible witnesses project therefore aimed to contribute to the educational environment alone.

The principle areas of the project were to:
- Study the (re)construction of gendered representations of STEM on children's television.
- Access - the ability to locate media content that is relevant to one's needs.
- Understand - the ability to understand meaning and context.
- Create - the ability to make sense of media content and undertake the strategies necessary to take advantage of their opportunities.

The methods used within the studies have been designed to engage with, and capitalise on, the participants' media literacy skills.

We have argued that the processes of interpreting images are important in the ways in which children and young people actively construct their view of the world, and their identities.
The activities aim to:
1. Understand the social construction of gender in STEM-related content.
2. Develop skills for interpreting media representations.
3. Run the activities with years 7 (aged 11-12 years) and 8 (12-13 years) in school.
4. Engage with media content and understand the strategies used in constructing representations of scientists.
5. Investigate the ways in which these images and stereotypes affect children's and young people's perceptions of STEM.

The project researchers are: Elizabeth Whitelegg; Dr. Jenni Carr and Dr. Richard Holliman; Dr. AM. A. Zing (example of the 'Draw-a-Scientist' briefing available from http://oro.open.ac.uk/10684/).

The Invisible Witnesses project therefore aimed to investigate the representations of STEM experts, and have some difficulty identifying those experts when those indicators are not present.

Invisible Witnesses
Drawing on young people's media literacy skills to explore gendered representations of science, technology, engineering and mathematics

For over 30 years researchers have been looking to understand how children and young people make sense of images and representations of scientists and are developed. Investigating the ways in which scientists and science are represented in media content is important for understanding how young people come to understand what it means to be a scientist in the 21st century. If young people do not engage with media content, they may not engage in STEM, at a time when decisions about their future study and careers are forming.

The Invisible Witnesses project aimed to investigate the representations of STEM experts, and have some difficulty identifying those experts when those indicators are not present. In some instances, single sex groups are used, there should be more than one sex group to be appropriate for the age group participating.

For instance, boys and girls were asked to draw a scientist in a previous study involving 90 children and young people. The young people remembered the images and stereotypes about their future study and careers are forming. The Invisible Witnesses project therefore aimed to investigate the representations of STEM experts, and have some difficulty identifying those experts when those indicators are not present.

Invisible Witnesses: Drawing on young people's media literacy skills to explore gendered representations of science, technology, engineering and mathematics

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