Accompanying Piece

Word count: 1642

For my student devised assessment, I decided to do a workshop in a primary school. My aim was to answer the question: How well do primary school aged children understand, interpret and reflect on genetics?

Audience selection:
I conducted the workshop to year 4 children (aged 8 and 9 years old). I chose to use this age group due to research suggesting the age that children begin to understand more complex ideologies is somewhere between 6-8. This meant that I was able to explain to the children what genetics is, what it is useful for and plant the idea in their heads that it can be manipulated and from this, see what their ideas around that are. Below this age, the children may not grasp the concept of the activities or be able to provide the more in depth thought of morals that I was looking for.

Current research:
I was unable to find any studies or information about the understanding children have around genetics, it is usually not until secondary school that they begin to know the basics and even then, this is purely from a scientific view, it does not involve the ethics around the subject. Therefore, I wanted to bring an interdisciplinary approach around genetics to these children, as was done in the module, to get them thinking about science and facts and getting them to learn about new things but also encouraging them to think about what they believe is right and wrong. I wanted them to think not only about the facts of science and how it may affect them but also how it affects the people around them and society in general. The closest things I could find based around my question were studies that looked at the development of children's morals in general. It seems that above the age of 6 is when this idea of morals and ethics can be approached as at this age children able to understand complex ideologies although they tend to prefer talking about topics that are familiar to them[i] and 6-8 years old is the age that children start to understand things such as death[ii]. It is by the age of 6 that children begin to develop a conscious and are aware of what they're not supposed to do[iii]. Children of this age start to consider how what they do affects other people. They begin to learn that other people also have viewpoints[iv]. Therefore, using a class of 8 and 9 year olds seemed appropriate for my workshop. Current research supports that children are able to understand ethics but they don't know much about what it means because they are not taught it enough[v].

Why this method?
I believed that doing a workshop was likely to engage the children the most. Using games and activities to explain the concepts of genetics and ethics seemed like the most appropriate method as children tend to learn through interaction and participating in activities. These children are unlikely to have thought in an interdisciplinary way and so this method of using a workshop with activities reinforces the biology by making it fun but also gives them a new and different way of thinking. This reinforced what I had learnt within the module, especially in the first session.

What I did

First of all, I gave the children a small presentation about what DNA was and got them to guess how much DNA is in each of our cells and how many cells the human body has[vi]- this was taught to us by Dr Robert Old[vii]; when talking about a topic it is important to know facts around it. I wanted to demonstrate to the children that everyone's DNA is unique. To do this, I created the activity 'whodunnit?' in which children had cards with DNA bands on to represent the results of an agarose gel electrophoresis. There was a column labelled "crime scene DNA' which had a set of DNA bands, and 4 further columns of suspect's DNA. The children were required to identify the criminal by matching the suspect's DNA to the crime scene. This reinforced that everyone's genetic profile is exclusive and demonstrated uses of DNA in society e.g. solving crimes.

The second thing I did was an activity called 'cracking the code' to demonstrate that DNA has a purpose and, through the production of RNA, it codes for amino acids and therefore your proteins and therefore for what we look like. The children had a sheet with RNA codes on. The children then had to use these RNA codes and the codon sheets to solve the order of the amino acid chain. These first few activities used ideas presented in Professor Moffat's lecture[viii], giving on overview of what DNA is and what it can be used for as well as showing the purpose of DNA within the human body.

Next, we played genetics bingo. I had made a list of words which were all genetic related and asked the children to pick 9. The aim of this was to give the children a chance to reflect on what features of theirs are inherited. Children may look in a mirror and know what they look like but they may not have an appreciation for what traits have come from their parents e.g. freckles, dimples, hair colour. The children really enjoyed this and interestingly, many of the children selected words that meant something to them e.g. one child said "I'm picking 'twin' because I have a twin". This idea helped me answer my question by listening to the responses of the children.

After this, I gave each of the children an outline of a face and asked them to design a person, thinking carefully about the shapes, sizes and colours of features. The results of this were very interesting. Some children drew pictures that looked like them, again, allowing them to reflect and what features they have that are genetic e.g. brown hair, blue eyes, freckles, whereas some children drew the opposite. I asked a lot of the children why they had selected certain features and a lot of the time they responded with "because I like it" and some copied people from my examples because they liked the way they looked, leading to discussions about whether if designer children were allowed, would people want their children to look like certain individuals or celebrities? This allowed me to move onto the next part of the task well. Once the children had completed their pictures, I decided to ask them whether designing what people look like is a good idea. We then had a discussion about the ethics associated with choosing what people look like. This activity was inspired from ideas discussed in week 5 by Caroline Wright[ix] surrounding reprogenetics and the idea of 'designer babies'[x]. This discussed ethical issues which helped me to answer my research question. This also discussed topics from session 9 delivered by Felicity Boardman which

was heavily focused around ethics and should certain lives be prevented due to their genetics?
Finally, drawing from Professor Moffat's workshop in the module, I believed that as well as just hypothetically learning about DNA, it would be useful for them to actually see some. In small groups, the children followed a protocol to conduct an experiment where they extracted the DNA from strawberries. The children were able to pick up the DNA with a glass rod.

Results

The 'whodunnit' activity really impress the students as they found it fascinating that leaving a hair or skin cell containing your DNA at a crime scene can get you caught. During 'cracking the code' I was asked if the body does what same thing and so they clearly understood how our body is using our DNA. Bingo showed that children were thinking about what is inherited as some said things such as "I didn't know my freckles were inherited" so clearly they were thinking more in depth about their traits. When drawing the designer babies, the children clearly weren't thinking too deeply about what they were doing and why, for example, some of the children wanted to design their babies to have vampire teeth or green hair, highlighting their naivety towards the subject. When the discussion started, I initially got the response that yes it was a good idea to design people because "you can make people look good" and "it would be good for people in families to look different so it's not boring". However, as we talked more about the ethics of 'designer babies', the children really engaged with why this could be a negative thing and began to understand that it's not as simple as just making someone look pretty and other factors must be considered. They came up with their own ideas such as designer babies "may take away their individuality" and that if someone was not genetically modified and everyone else was then they may feel left out. This brought ideas from the film that we watched in the module into play, GATTACA[xi] . The film portrays that genetic engineering could lead to people conceived naturally being inferior. One of the teachers had children with genetic defects and so it was interesting to discuss this with the children about how if this teacher were to have another child, would using biotechnologies to ensure these children did not have genetic defects have negative impacts on her other two children by saying they're not good enough how they are. Therefore, the results of this workshop support the hypothesis that even young children can understand difficult and somewhat complex concepts that society is currently debating. They are indeed able to understand basic facts about genetics, interpret what DNA can be used for and reflect upon the risks and benefits of using it in different ways.

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[i] http://jme.bmj.com/content/31/12/715
[ii] http://phenomena.nationalgeographic.com/2013/07/26/when-do-kids-understand-death/
[iii] http://community.seattletimes.nwsource.com/archive/?date=19941025&slug=1937798
[iv] https://www.askdrsears.com/topics/parenting/discipline-behavior/morals-manners/5-stages-moral-growth-children
[v] http://rockethics.psu.edu/this-is-the-rock/news/children-and-the-development-of-ethical-decision-making
[vi] https://hypertextbook.com/facts/1998/StevenChen.shtml
[vii] Dr Robert Old, session 3, Genetics Science and Society 2018
[viii] Professor Kevin Moffatt, session 2, Genetics, Science and Society 2018
[ix] Caroline Wright, session 5, Genetics, Science and Society 2018

[x] https://en.oxforddictionaries.com/definition/designer_baby
[xi] GATTACA, Andrew Nichol, 1997