

Rethinking Research for Genetically Modified (GM) Food

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Abstract—This paper suggests a rethinking of the existing research about Genetically Modified (GM) food. Since the first batch of GM food was commercialised in the UK market, GM food rapidly received and lost media attention in the UK. Disagreement on GM food policy between the US and the EU has also drawn scholarly attention to this issue. Much research has been carried out intending to understand people's views about GM food and the shaping of these views. This paper was based on the data collected in twenty-nine semi-structured interviews, which were examined through Erving Goffman's idea of self-presentation in interactions to suggest that the existing studies investigating "consumer attitudes" towards GM food have only considered the "front stage" in the dramaturgic metaphor. This paper suggests that the ways in which people choose to present themselves when participating these studies should be taken into account during the data analysis.

Keywords—Boundary work, demarcation of science, GM food, self-presentation

I. INTRODUCTION

GENETICALLY modified food has received much public attention since the introduction of the first products to the UK market in 1996. Debate has been intense and the introduction of this technology has been strongly resisted. Its advocates believe that the technology could be a solution to otherwise insoluble problems of food supply and security. Opponents worry that it might result in unforeseen risks to health, environment and the whole ecosystem. The concern that this technology might give even more control to the multi-nationals over the food supply was also prevalent.

The impact of the GM food debate has not been exclusively felt in UK domestic policy but has also caused international trade controversies. Disagreements between the US and the EU on GM food issues surfaced in international dispute resolution processes. US agricultural interests believe that more restrictive labelling policies, a moratorium on approving new GM crops, and grocery store bans on GM food are simply ways for the EU to protect domestic agriculture from international competition. The EU argues that their precautionary policies towards GM food are the result of the public's concern for food safety. The US first filed a complaint over the EU's position on GM food issues with the World Trade Organisation (WTO) in May 2003. Consequently, the self-imposed moratorium on importing GM food in Europe was lifted in 2004, meaning it is now legal to import GM food into Europe. The WTO declared that the EU's GM food ban was illegal in 2006. The ruling is a victory for the

US GM crop farmers, the biotechnology industry, and large food companies such as Monsanto and Syngenta, who have been frustrated by the moratorium and the slow pace of approvals for new GM products in the EU. This ruling has, however, been castigated by European environmental and consumer groups, who see it as an example of international trade organisations overturning local democratic decisions aimed at protecting consumer health and safety.

In a speech addressed to British farmers and the food industry at the Oxford Farming Conference, the UK government's chief scientific adviser, Sir John Beddington stated that there is a need for "a new and greener revolution" to increase food production [1]. Beddington emphasised that Britain should embrace technologies such as GM crops and nanotechnology in order to tackle the issues of climate change and food shortages. At the same conference, the environmental secretary at that time, Hilary Benn, launched the government's food strategy for the next 20 years, he proposed a "consumer-led, technological revolution" to transform UK farming. These statements signal an attempt to re-introduce GM food into public debate by re-packaging the technology as the solution to the global food crisis and climate change, i.e. a "greener" option. The government at the time appears to have decided it was the right time to push the debate further after the failure of the first attempt to introduce GM food into the UK. As a result, GM technology was re-branded as a more sustainable and energy efficient way to produce food, in the hope of losing the negative connotations people associate with GM food, such as "Frankenfood" or "killer tomatoes" [2].

Despite a change of government later in 2010, the idea that GM food can be a "greener option" in food production has received further media attention. For some, restrictive GM policy is "both unscientific and obstructionist" thus "flawed" [3]. To date, the debate over GM food remains inconclusive. Further investigation of people's views about GM food is, therefore, crucial for decision makers. However, some issues have surfaced in the existing GM food research, which is important to consider. This paper highlights some potential problems with previous research into people's views in GM food and suggests a re-thinking for future research.

II. SOCIAL RESEARCH ABOUT GM FOOD

A. Research Trajectories

As the debates surrounding GM food intensify, decision makers in the public and private sectors are interested in learning people's views about GM food, in the hope to understand the opposition it has received. Subsequently, much social research has been devoted to understand people's

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thinking about GM food. Due to the wide spectrum and the complexity of social researchers' interests in GM food, this paper only intends to discuss the existing literature in an extremely generalised classification.

One of the main research trajectories is to investigate people's views on GM food and to suggest a viable solution to policy-making. Many researchers in this field begin with the assumption that the UK public is worried about this technology. Some then set out to investigate people's acceptance of GM food e.g. [4]-[7], [9]. Some examined people's concerns and tried to identify possible policies to address these concerns e.g. [8]-[10]. Others try to understand how people form their views about GM food e.g. [4]. Marris et al. published the influential report which identified ten "myths" about genetically modified organisms (GMOs) [11]. They challenge the popular beliefs about GM food at the time, such as people are either "for" or "against" GMOs. Gaskell et al. conducted a large scale survey across EU Member States on the "public perception" of a range of biotechnologies [7]. Some of the research investigates the factors that might affect people's acceptance of GM, proposing strategies to improve the way in which GM food is seen and considered e.g. [12]-[14]. People's views about GM food and how these views are formed received a great deal of scholarly attention when GM issues were high profile. Although the debate about GM food is still ongoing in the UK, the attention it receives from the media has rapidly faded [15].

B. Through Goffman's Lens

This paper proposes the use of Erving Goffman's ideas to re-think the existing research on GM food issues. In his seminal book *The Presentation of Self in Everyday Life*, Goffman [16] refers to face-to-face interactions as theatrical performances, which he argues involve two types of activity: the expression one "gives" and the expression one "gives off". The former involves verbal symbols or the equivalents, which are used to communicate ideas that are attached to these symbols. Goffman suggests that this is a traditional form of communication. The latter form of communication, which is the focus of his book, encompasses a broad range of activity performed for reasons other than the information conveyed. Goffman argues that our communication in everyday life is based on inferences. We can only extrapolate about others' reality based on the information we receive. Most people try to present themselves in the way that they wish to be seen by others. Similarly, people also try to present their feelings towards others in the ways that they want their feelings to be perceived. Goffman argues that in order to sustain this interaction in our everyday life, a certain level of harmony has to be achieved. This paper argues that people's self-presentation within everyday communication is an innate feature of qualitative data that has long been overlooked in GM food research. This paper suggests that the ways that participants present themselves in the existing literature on people's thinking about GM food is one of the issues of public meaning that has been long overlooked.

III. METHODS

This paper presents only a part of a wider study concerning university students' discourse about their food practices. Since this study set out to understand the discourse university students adopt to talk about their food practice, a more inductive research method was selected. Twenty-nine semi-structured interviews were carried out with university students at the University of Nottingham. The respondents were recruited for a study about students' food practices rather than specifically about GM food. All of the participants were doing their bachelor degree at the time of the interviews.

Theoretical (or purposive) sampling strategy was adopted for recruiting participants. The relation between the vague concepts that were brooding at the time was only to be discovered after the data were collected. First of all, all participants in this study reported themselves as British. This was an attempt to narrow down the scope of the cultural differences in the participant's food practices. The gender and the academic discipline were the main criteria of the recruitment. Similar numbers of participants in each category was recruited to provide a balanced account of the four chosen groups.

First year students were excluded from this study due to the evidence collected from a pilot study, which suggests that first year students tend to have little independent experience in food in general. This is particularly true as the majority of the first year students at the University of Nottingham stay in catered halls. Consequently, they do not seem to have to think about food as much since it is provided to them in student halls. Furthermore, this study set out to investigate the ways in which Natural science and Humanities and Social Sciences (HSS) students talk about GM food. In the pilot study, first year students demonstrated that they have limited experience in their academic disciplines and therefore were not included in the study. Several themes emerged from university student's discourse about GM food, which are examined through Goffman's lens in the following discussion.

IV. DISCUSSION

A. The Construction of Natural Science/HSS Student Images

In university students' discourse, "science" appears to be regarded as having innate credibility¹. The boundary between "science" and "non-science" is still deeply rooted in both natural science and HSS students' discourse. University students not only constructed a boundary between "science" and "non-science", they also presented themselves as a member of either the "science" or "non-science" community.

Natural science and HSS students in this study employed distinctive framings in their discourse, particularly when they were talking about GM food and other supposedly scientific matters concerning food, such as pasteurisation. A more

¹ It is not suggested here that 'science' should not have more authority in their domains of study. Nevertheless, 'science' is a broad term and the knowledge involved in various scientific disciplines can differ considerably.

“scientific framing” was adopted in natural science students’ discourse. They were prone to choose more scientific/technological terms and use biological jargon. The scientific framing was employed to talk about what they considered to be “scientific matters”, even though they might not be particularly familiar with that aspect of “science”. By contrast, HSS students had the tendency to use a less scientific framing when talking about GM food. They were more likely to refer to public concerns and the ethical considerations over GM food, as opposed to the technical issues such as the safety of genetic modification and its mechanism. The distinctive choice of framings can be demonstrated in the following interview excerpts.

Third year natural science student Molly² talked about her understanding of GM food as change of genes and expressed her personal view about it.

YL: Can you tell me what you know about it (GM food)?

Molly: I know about well the way they take something out and change different genes so they’re not on sort of- But yeah I don’t have huge problem with it, but I don’t know.

When Molly was asked what she knew about GM food, she talked about the way in which the genetic modification is carried out. Similarly, second year natural science student Josh also talked about the technical side of GM food when he was asked what he knew about GM food.

Josh: You- there’s technical- well all food is technically genetic modified because it’s produced from that- you know, the cows you eat and the fish you eat all like bred, cross breed over [...] But cross breed to get a certain way with genetically modification is specifically altering like the, some of the DNA [...] I don’t know, I don’t really have any opinions.

Natural science students were more prone to talk about the technical side of GM food when they were asked what they know about it.

A different focus can be found in HSS students’ discourse about GM food. When third year HSS student Jean was asked what she knew about GM food, she talked about bioethics because of a course she was doing at the time. Her view about GM food was linked to the potential that GM food can alleviate the famine in “developing countries”.

Jean: I take a bioethics class so you know I heard- it was more a bioethics than food but it like came up, like Dolly the sheep and like that.

YL: So what do you think about GM food personally?

Jean: I think it was alright, if it’s safe, which they’re saying that it is, like it’s exactly the same then I don’t really see the problem with it. I think it can help a lot, if you know, especially in developing countries. If you can grow, like

genetically modified corn or something like that can really help poor people.

Similarly, third year HSS student Shaun commented on the social impacts resulted from GM food when he was asked about what he had heard about GM food.

Shaun: I know that British people, British society was largely anti and we saw a great rise in GM food and faced a bit of a backlash. That’s pretty much disappeared in the UK now. We don’t purchase GM food at all, it’s not accepted in this country. I don’t know why, I suppose it’s moral issues, and health issues largely; a lot of uncertainties surrounding GM food.

The difference between natural science and HSS students might be a result of the fact that students are prone to talk about what they are more familiar, and therefore, natural science students were more confident with the technical side about GM food whereas HSS students might be more confident talking about GM food regarding to its impact to the society.

Students in this study were prone to talk about “science”, “scientific” and “scientists” in an instrumental way, rather than about any specific domain of scientific knowledge. The different framings adopted by natural science and HSS students can, therefore, be conceptualised as self-presentations drawing on the instrumental use of the term “science” [17]. The distinction between using science as culture and as resource in people’s discourse about GM food has not been emphasised in the existing GM food research.

Students not only adopted different framings to talk about GM food, they also drew on this difference in constructing their own images. In other words, students did not merely draw the boundary between “science” and “non-science”, but also presented themselves as part of either community to suit their roles as science or HSS students. The following example demonstrates the way that the boundary was drawn in natural science students’ discourse. When second year natural science student Alex was asked whether he considered himself as well informed about food, his role as a scientist student was underscored.

YL: Do you think you’re well informed about food?

Alex: Well, I suppose ‘cause I do like a biology subject. I’ve been doing it since I was a kid and now I know like which vitamins you need and which- how much sugar [...] and how much water you need to drink and stuff like that, I suppose, or the effects to double alcohol and sugar on like- how your brain works and caffeine and stuff like that, I suppose I do know quite a lot about it. Just based on what logically applying what I know from studying biology and stuff like that.

Final year HSS student Cecily claimed to know very little about GM food but she was able to identify part of the wider GM food debate.

Cecily: I’ve heard that, like people say it’s not good for you, not normal to try a new science to

² Pseudonyms are used throughout this paper.

change like basically nature and stuff like that. But it doesn't really bother me to be honest.

YL: Why?

Cecily: I don't know, I just- I'm not very scientifically minded, I don't really think about stuff like that. I don't ever really like listen to that sort of things that much. I mean if it was like definitely it's bad for you, I wouldn't have it but it's all kind of up in the air and no one really knows if it's actually bad for you.

In her response, Cecily emphasised that she is not "scientifically minded" so she does not really think about "stuff like that". She also admitted that she did not listen to "that sort of things". It becomes clear that when students talk about what they consider as scientific, they have the tendency to draw a boundary between "scientific" and "non-scientific" and subsequently put themselves into either category as they see appropriate.

Furthermore, the science and HSS student images constructed in the interviews seem to result in their claiming and disclaiming of general knowledge in science. Students can be seen to be adopting a "role" as a member of the science or non-science community and then playing their roles accordingly. When talking about GM food, science students presented themselves as having "general scientific knowledge" whereas HSS students presented themselves as having no "general scientific knowledge". Natural science students' discourse is firstly presented in the next section, which is followed by a discussion of HSS students' discourse.

B. Natural Science Students' Claiming of General Scientific Knowledge

Natural science students claimed their general knowledge in science in both a direct and an indirect manner. Most natural science students suggested that people do not like GM food because they do not understand it, an interpretation which is often known as the "deficit model". The deficit model refers to "the assumption that it is a lack of public understanding or knowledge that has led to the present climate of scepticism towards science" [18:4]. Natural science students' use of the deficit model is an example of direct claiming of general knowledge in science. This can be demonstrated in second year natural science student Emily's response to whether she thought she was informed about GM food.

YL: Do you think you are well informed about GM food?

Emily: Yeah I would say [...] because people just say oh I don't like it, a lot of people would be like not knowing what is going on. They don't know much about it but then I don't agree with it.

Amongst the natural science students who claim their authority in science directly, "the publics" or "people" were sometimes described as less qualified to understand "science" than themselves who were doing science related degrees. Similarly, second year science student Juliette described herself to be more informed about GM food than "the average general

public", who was assumed to be less interested in "science and stuff". In her response, Juliette reiterated the boundary between the scientists and non-scientists, i.e. the "general public". Her lack of interest in politics was used as a comparable analogy to public's lack of interest in science.

YL: Do you think you are well informed about GM food?

Juliette: I think I'm pretty well informed [...] I don't think that average general public are as well informed because I don't think there's not that much out there. To be quite honest, if I was reading a paper and I wasn't interested in science- I mean I do it now because the stories, I'm not really interested in politics so I follow other stories. So a lot of the general public aren't that interested in science and stuff, I don't think on the whole they are as well informed.

Although it was not explicitly stated in natural science students' discourse, "the publics" was often portrayed as people who have not received formal scientific training, and thus are excluded from the science community. However, whether this suggests that natural scientists believe that people inside of the science community are not part of "the publics" requires further investigation. This direct claiming of general knowledge in science was not uncommon in natural science students' discourse.

Other natural science students claimed their general knowledge in science in an indirect manner. When asked about GM food, these students acknowledged their own limited understanding about GM food and highlighted this in the interviews. They were aware of the broad spectrum of knowledge that can be considered as "natural science" and therefore were careful not to claim general authority in science, which was, however, claimed in a more subtle way. This following quote from science student Jeremy provides an example of how this was done:

YL: Do you think you're well informed about GM food?

Jeremy: I wouldn't say I'm better informed than an average person. Possibly just because I'm a little bit more aware of science and things then I may have a little bit more information than those people. But I'm no sense of an expert, not even among my peers.

Whilst acknowledging that he is not particularly well informed about GM food, Jeremy claimed to know more than those who have not received training in science. This was again highlighted in my discussion with Jeremy on whether he thought he was better informed than "the public" about GM food.

Jeremy: It really depends on who you are talking out of the general public, probably not, no, not hugely more informed. I mean just coming from a science background now just means the way I think about, I have a slightly different view on these things to somebody who

doesn't have any formal kind of science training.

In this comment, Jeremy claims that he does not consider himself to be more informed about GM food than the general public. At the same time, he also suggests that he would have "slightly different views on these things" because of his science background. It appears that Jeremy was suggesting that people who have received formal science training, such as himself, will look at scientific matters differently from those who have not, whether they are informed about the topic or not. What Jeremy meant by "a different view" can be interpreted as a "scientific" as opposed to a "non-scientific" view, with the non-scientific view being positioned as less valid. Jeremy is an interesting case because he used to study in a "non-scientific" discipline until six months prior to the interview. His response implies that being in scientific discipline for six months is sufficient for him to claim that he has been trained in science and therefore is more aware of scientific topics such as GM food than those who have not been trained in science. The idea that students in natural science disciplines are supposed to have more authority in "science" was also shared by HSS students, whose discourse will be examined in the next section. This shared understanding may be the reason that Jeremy adapted his position so quickly after he changed his academic discipline, moving from seeing himself as outside to inside of the science community.

C. Discourse about Information Acquisition

In the existing literature about GM food, some researchers are interested in the association between information provision and people's feelings about GM food. For instance, Lusk and colleagues [14], [19] are interested in whether the information about benefits of GM food can enhance consumers' acceptance of it. Whilst an association between the information provided and consumer acceptance of GM food may well exist, it is important to question what kind of GM relevant information people are likely to receive in their daily lives. Both natural science and HSS students in this study reported that they had not actively looked for information about GM food. They claimed to have received little information about GM food in their daily lives. This lack of information was subsequently justified through the claiming or disclaiming of general scientific knowledge discussed above.

Presenting themselves as having general scientific knowledge, students in natural science disciplines expressed the belief that they did not need to acquire further knowledge about GM food because they were already better informed than people outside of the science community. This was demonstrated in the interview excerpt from Jeremy's interviews presented earlier. It can also be seen in natural science student David's comment:

David: Probably bad to ask me now 'cause it's [GM food] been out of the news for a while so I'm less well informed than I have been but I would consider myself adequately informed to make decisions that you asked.

In a similar way to Jeremy, David emphasised that he did not

see himself as particularly well informed about GM food but he considered himself adequately informed to comment on the GM food topics raised in the interview. It is possible that David and Jeremy are better informed about GM food simply because they are in natural science disciplines; however the focus here is not to examine whether natural science students are better informed about GM food but the ways in which they talk about their own authority in science and information acquisition. Amongst the students who reported not having actively sought out information about GM food, more natural science students felt the need to justify not having done so. The most common justification was that they know enough about GM food and therefore do not consider it necessary to actively seek for further information, as demonstrated in Jeremy and David's interview excerpts. Similarly, final year natural science student Katie also adopted this justification in the following interview excerpt. She claimed to not have actively looked for information regarding to food issues because she knows enough about them.

YL: But have you actively looked for information about food?

Katie: No, never I don't think.

YL: Why do you think that is?

Katie: I think I already have a knowledge of it, 'cause when I was younger I'd ask my dad like is this good for me? Like when we were having dinner, like what has it got in it. And he'll tell me like this is a source of blah blah blah. 'Cause he is a scientist and he'd say this is good for blood, this and that. And so I just have that knowledge.

YL: Do you think you're well informed about GM food?

Katie: I could know more but I think yes I am.

YL: Where did you most likely to get the information from?

Katie: I'll say doing my studies, that's it.

In this excerpt, Katie described her trust in her father as an information source not because of his role as her father but more due to his role as a scientist. It was not specified whether he is a biologist, a food scientist or a physicist. Her father being a "scientist" seems to be sufficient to support the credibility of his knowledge. Therefore, her father was described as an authoritative figure. Moreover, Katie claimed that her knowledge about GM food was acquired through doing her studies in natural science. As a result, she did not have to look for information anywhere else.

In contrast to natural science students, HSS students did not attempt to justify for not having actively seeking information about GM food. They presented themselves as having no general knowledge in science; explained not having actively looked for information about GM food by reference to a completely different reason from natural science students. Third year HSS student Cecily was convinced that she was not "scientifically minded" and thus had never paid attention to information about GM food.

Cecily: I'm not very scientifically minded, I

don't really think about stuff [GM food] like that. I don't ever really like listen to that sort of thing that much [...] I do actually think it is just because I don't know about science so in my head I kind of switch off a bit. When they start to talk about that sort of things I just like oh. I don't know, I don't understand what they're talking about so I'm not gonna bother listening basically.

Cecily described herself as not having actively looked for information about GM food. In fact, she reported herself as actively avoiding information about GM food, whether consciously or not, by "switching off". Cecily suggests that this is because she would not understand what "they" are talking about. Some HSS students, like Cecily, seem to be suggesting that there is a deficit in scientific knowledge on the part of people outside of the science community. As non-members of the science community, they presented themselves as having no authority in science and therefore claimed to have the tendency to "switch off" when scientific information is available to them. It was suggested that even if scientific information is accessible, they would be reluctant to learn about it because they are convinced that they would not be able to understand "that sort of things."

Final year HSS student Emma adopted similar discourse to talk about how she deals with GM food information that is too "scientific". Emma is one of the few students who feels more strongly about GM food, which might resulted in her being more eloquent when speaking about this topic. However, like many of other HSS students, she claimed the topic is something she does not know much about.

Emma: I'm personally against it but I think I should know- I feel like it's something I don't know very much about.

YL: Why is that?

Emma: I don't know, I'm just a bit worried because I'm not very much a scientific person. And so it's something that I think oh god it's too complicated for me to understand.

YL: Have you read anything and thought it was too scientific?

Emma: I haven't really read very much about it, it's something that doesn't grab me as much as like learning more about organic food, learning more about fair-trade.

In this interview excerpt, Emma reported herself as "not very much a scientific person" and therefore she finds the information about GM food too complicated to understand. However, when she was asked to give a specific example of not being able to understand scientific information, she claimed that it is simply something that does not grab her attention, unlike other supposedly less scientific topics, such as organic food and fair-trade.

V. CONCLUSIONS

A. University Students in Two Cultures

The distinction between science and HSS students' self-presentation can be discussed by reference to the "two cultures" in C. P. Snow's [20] famous lecture *Two Cultures and the Scientific Revolution*, in which he identifies a gulf of mutual incomprehension between scientists and literary intellectuals. Snow observes that both literary intellectuals and scientists have an ingrained impression of each other, not necessarily completely wrong, but "destructive". The divide between the two cultures is found to be prevalent in university students' discourse, particularly in claiming and disclaiming of general scientific knowledge. This suggests that students' choices of academic disciplines contribute to the ways in which they present themselves. Generally, studies investigating people's understandings of GM food overlook their participants' self-perceived roles. In the FSA report "Exploring attitudes to GM food", "confident" participants were described as answering questions about GM food in more length and greater detail; they tended to talk about the process of altering DNA or genes and cited a wider range of information sources, including news media, education and scientific periodicals [21]. By contrast, "less confident" participants in their study used less certain expression such as "I suppose" or "I guess". They did not usually give an account of the process of genetic modification and described a narrower range of information sources. The descriptions of the "confident" and the "less confident" participants in this report resembles the images created by the natural science and the HSS students in this study. In all the social research that attempts to understand GM food and the society, more caution is needed in attributing participants' use of scientific jargon to a greater confidence about their knowledge and vice versa. The way in which participants want to be seen by those who carried out the study (or the potential readers) should also be taken into consideration while the data are analysed.

This paper also challenges Snow's assumption that the gap between scientists and literary intellectuals is created mainly by their interest in the field. This study suggests that the gap described in Snow's lecture is also shaped by the ways that scientists and literary intellectuals feel they should behave and speak about "scientific matters".

B. Learning to be a "Scientist"

This paper suggests that recognising the impact of the perceived boundary between the constructed science and non-science community can be important in the interpretation of qualitative data in GM food research. This paper has demonstrated that university students have the tendency to position themselves as either inside or outside of the science community and then present themselves accordingly in interaction. This demarcation has also been widely discussed by people outside the university student population. For instance, in the BBC Reith Lectures 2010, the former president of the Royal society Martin Rees was asked by a visiting

professor at the University of Plymouth, “[...], in effect I as a scientist in one field have to take on authority almost everything else in science. Should I?” This rhetorical question confirms that the claiming and disclaiming of general scientific knowledge is not a unique feature of university students’ discourse but also prevalent amongst academics. This paper suggests that university education does not only provide knowledge in specific subjects, it also institutionalises students into science or non-science community. This might be rooted in conventions of the UK educational system, but this is an issue which is outside of the remit of this paper³.

This paper wishes to reiterate that researchers cannot escape from the social world in which we study [22]. The presence of the researcher and the subsequent influence of the interaction between the researcher and the researched cannot be avoided. It is, therefore, essential for researchers to take account of their existence and the subsequent interaction in their data analysis. The “reflexivity”, which requires “the researcher to consider possible reasons why our research participants behave as they do in the context of our research” [23:195], appears to have been overlooked in the existing GM food research.

C. The Challenges in “Risk Communication”

This study also has some implications for policy makers. It has been identified in the existing GM literature that one of the main difficulties in GM food policy is to communicate risks of scientific uncertainty to people. This paper suggests that before focusing on the communication of “scientific risks”, it is worth raising the awareness of the innate uncertainty that exists in science in the first place. Much of this is currently done by natural scientists who have been devoting much of their time to engage “the public”. However, due to their place in the science community (to both themselves as well as the publics), the way in which the scientific findings are presented can sometimes be considered to be too “scientific”. As demonstrated in this study, people who consider themselves as outside of the science community can find the information too technical and therefore simply assume that they would not understand it. This might lead to the belief that they are rightly ignorant about all scientific matters. As a result of that, scientists can sometimes find it difficult to reflect on the value of their own work and some can even come to “resent the loss of time and the way in which their honest efforts for society will be twisted, and they may even face personal recrimination” [24:436]. This paper suggests that natural scientists may sometimes be over-loaded with responsibility. They are not only expected to be good scientists but also good communicators. Although many of them adept at both roles, sometimes people who consider themselves to be outside the science community may think that natural scientists have the agenda of promoting science when communicating their findings with people outside of the

science community. The problem with communication between science and non-science communities is often not only rooted in the ways in which the communication was carried out. Whilst many outstanding natural scientists have invested time into trying to use “plain language” to speak to those outside of science community, this study has demonstrated that people’s perception about their roles as inside or outside of the science community can be hard to break. Therefore, it is important to train people who are not part of the science community but can understand and address public concerns about scientific developments.

Social scientists in the UK, a group who are well suited to bridge this gap, are currently being confronted by a series of changes to Higher Education and funding cuts, and many are finding themselves being in the position of having to justify their existence. The analysis presented in this paper confirms that one valuable role that social scientists are well suited to fill is that of bridging the gap between scientific developments and the people who are confronted by the implications and impacts of these developments, particularly in the age of the “Risk Society” [25].

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REFERENCES

- [1] J. Vidal and F. Lawrence, "Britain must launch GM food revolution, says chief scientist," *The Guardian*, 2010.
- [2] Nerlich, B., Clarke, D. D. & Dingwall, R. (2000) "Clones and Crops: The Use of Stock Characters and Word Play in Two Debates about Bioengineering," *Metaphor and Symbol*, vol.15, pp.223-239.
- [3] H. Miller, "How we engineered the food crisis," *The Guardian*, 2011.
- [4] L. Bredahl, "Determinants of consumer attitudes and purchase intentions with regard to genetically modified foods- results of a cross-national survey," *Journal of Consumer Policy*, vol. 24, pp.23-61, 2001.
- [5] G. Gaskell, M. W. Bauer, J. Durant and N. C. Allum, "Worlds Apart? The Reception of Genetically Modified Foods in Europe and the U.S.," *Plant Biotechnology: Food and Feed*, vol. 285, pp.384-387, 1999.
- [6] G. Gaskell, N. C. Allum, W. Wagner, N. Kronberger and H. Torgersen, "GM Foods and the Misperception of Risk Perception," *Risk Analysis*, vol. 24, pp.185-194, 2004.
- [7] G. Gaskell, A. Allansdottir, N. Allum, C. Corchero, C. Fischler, J. Hampel, J. Jackson, N. Kronberger, N. Mejlggaard and G. Revuelta, "Europeans and Biotechnology in 2005: Patterns and Trends," *Final Report on Eurobarometer*, 2006.
- [8] D. Barling, H. de Vriend, J. Cornelese, B. Ekstrand, E. Hecker, J. Howlett, J. Jensen, T. Lang, S. Mayer and K. Staer, "The social aspects of food biotechnology: a European view," *Environmental Toxicology and Pharmacology*, vol. 7, no.2, pp.85-93, 1999.
- [9] M. Costa-Font, J. M. Gil and W. B. Traill, "Consumer acceptance, valuation of and attitudes towards genetically modified food: Review and implications for food policy," *Food Policy*, vol. 33, pp.99-111, 2008.
- [10] Y.-L. Lin, *Differences between UK and US consumer buying behaviour of GM food*. Guildford, University of Surrey, 2005.
- [11] C. Marris, B. Wynne, P. Simmons and S. Weldon, *Public Perceptions of Agricultural Biotechnologies in Europe: Final Report of the PABE research project*. 2001.
- [12] J. L. Lusk, "Effects of cheap talk on consumer willingness-to-pay for golden rice," *American Journal of Agricultural Economy*, vol. 85, no.4, pp.840-856, 2003.
- [13] J. L. Lusk, M. Moore, L. O. House and B. Morrow, "Influence of brand name and type of modification on consumer acceptance of genetically

³ More detail can be found in Professor Edgar Jenkins’ paper E. Jenkins, "School science: a questionable construct?," *Journal of Curriculum Studies*, 39, no.3, pp.265-282, 2007. where he discusses the construct of “science” as a subject at schools in the UK.

- engineered corn chips: a preliminary analysis," *International Food and Agribusiness Management Review*, vol. 4, pp.373-383, 2002.
- [14] J. L. Lusk and A. Rozan, "Consumer acceptance of biotechnology and the role of second generation technologies in the USA and Europe," *TRENDS in Biotechnology*, vol. 23, no.8, pp.386-387, 2005.
- [15] L. A. Marks and N. Kalaitzandonakes, "Mass media communications about agrobiotechnology," *The Journal of Agrobiotechnology Management and Economics*, vol. 4, no.3&4, pp.199-208, 2001.
- [16] E. Goffman, *The Presentation of Self in Everyday Life*. London: The Penguin Press, 1959.
- [17] B. Wynne, "Seasick on the Third Wave? Subverting the Hegemony of Propositionalism: Response to Collins & Evans (2002)," *Social Studies of Science*, vol. 33, pp.401-417, 2003.
- [18] P. Sturgis and N. Allum, "Science in Society: Re-Evaluating the Deficit Model of Public Attitudes," *Public understanding of science*, vol. 13, no.1, pp.55-74, 2004.
- [19] Lusk, J. L., House, L. O., Valli, C., Jaeger, S. R., Moore, M., Morrow, J. L. & Traill, W. B. (2004) "Effect of information about benefits of biotechnology on consumer acceptance of genetically modified food: evidence from experimental auctions in the United States, England, and France," *European Review of Agricultural Economics*, vol. 31, pp.179-204.
- [20] C. P. Snow, *The Two Cultures and the Scientific Revolution*. London:Cambridge University Press, 1959.
- [21] R. Sheldon, N. Cleghorn, C. Penfold, A. Brown and T. Newmark, *Exploring attitudes to GM food Final Report*. 2009.
- [22] M. Hammersley and P. Atkinson, *Ethnography: principles in practice*. Oxon:Routledge, 2007.
- [23] E. Murphy and R. Dingwall, *Qualitative Methods and Health Policy Research*. New York:Aldine de Gruyter, 2003.
- [24] D. Burke, "GM food and crops: what went wrong in the UK: Many of the public's concerns have little to do with science," *EMBO reports*, 5, pp.432-436, 2004.
- [25] U. Beck, *Risk Society: towards a new modernity*. London:Sage, 1992.