If the Public Only Knew! On Learning about Genetic Engineering

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Abstract

The term 'information' is problematic for various reasons. For example it presupposes that knowledge may be transferred like a good or a datum from those who possess it to those who don't have it, yet. This understanding of learning processes has been criticised for the hierarchy it creates between experts and laypersons that characterises the so called 'deficit model'. The idea behind it emphasises the role of those who provide information and at the same time ignores the contribution of those who are intended to be the receivers. But why should information be so important in the first place? To answer this question the article will examine the question of the relationship between knowledge about and attitudes towards genetic engineering and thereby question what can be called a knowledge-acceptance assumption which presupposes that resistance to genetic engineering results from a lack of knowledge. Against the backdrop of this assumption information is understood to be the appropriate means to solve acceptance problems. Little support can be found from empirical data, however, to verify the view that more knowledge would automatically increase acceptance. Finally, the article will address a general technology policy aim of democratising design processes. The focus will be on participatory activities. Four principles are central for learning processes aiming at participation: interaction, experiences, a relation to everyday life and concrete opportunities for action. In the concluding section of this paper the issue of what it could mean to put these four principles into concrete learning practice and whether they open up a perspective to overcome the criticised information paradigm will be discussed.

A need for information

This article comments on some aspects of a project the IFF/IFZ (Inter-University Research Centre for Technology, Work and Culture) carried out from 1998 until 2000 in the province of Styria[1] (cf. Wieser *et al.* 2001a). The project's main goal was to provide better information on genetic engineering for the general public. It can be understood as an outcome of the public controversy in Austria, which had its temporary climax in the late nineties. Two political incidents should be mentioned: first, the national referendum in April 1997 which advocated the exclusion of GMOs (genetically modified organisms) from agriculture and food production and a ban on patenting life (Austrian Parliament 25.4.1997: 1); second, a commission of enquiry in March 1997 (Styrian Enquete on Genetic Engineering in Agriculture and Food Production; cf. Spök 1998: 225) with participants from local government, researchers, entrepreneurs, farmers and NGOs, which came to the conclusion that more efforts should be made to inform the people of Styria. Following this recommendation, the IFF/IFZ suggested organising a series of public workshops, where interested people would find an opportunity (1) to learn more about genetic engineering, (2) to ask experts their individual questions and (3) to address their concerns and discuss them with others.

Workshop setting

The target group of our series of workshops were what we called 'multipliers': people who deal with the issue of genetic engineering in some way or another and who talk about it with other people, be it in a professional context or in the course of voluntary work. The largest group of the participants were teachers (15%), but there were also mayors and other local politicians, farmers, physicians and people from food, health or environment professions.

The workshops were devoted to the rural regions of the province to take steps against the usual concentration of information in the capital. They took place on weekends or in the evenings and they lasted for about 4 to 5 hours. The organising team consisted of STS researchers from the IFF/IFZ with interdisciplinary backgrounds in biology, genetics and education. The workshops were co-organised with local actors who helped to develop individual agendas for each event. Depending on the topics chosen, we invited scientific experts working in that specific field to participate in the workshops. Applications of genetic engineering in agriculture and food production were chosen the most. Altogether approximately 200 people participated in ten workshops.

The workshops were clearly intended to go beyond a rather instrumental information campaign approach: they were designed to make interactive learning processes possible. It is precisely this difference between information campaigns and interactive learning processes that prompted the following critical reflections.

The politics of information

The term 'information' is problematic for various reasons and has many shortcomings, but at the same time there are reasons why it is so gladly used.[2] A call for information can rely on a broad consensus and therefore it is a lot easier to raise funding under the banner of information than to do this in terms of mutual learning. Information is a generally positively connoted term and it helps to argue in terms of objectivity. The idea behind 'information' follows the positivist postulate of value free science that can be reported about in a neutral way. From a social constructionist point of view, by contrast, we can argue that information can never be neutral. However, this standpoint is not common sense yet and as a political statement it is still problematic to say: 'We want to provide information, but unfortunately we cannot be objective'.

Nevertheless the term information is problematic for another reason. It presupposes that knowledge may be transferred like a good[3] or a datum from those who possess it to those who don't have it, yet. Such a conception of learning processes—which could be called an 'economism' in learning—has been criticised a lot (e.g. Dewey 1916; Freire 1970; Felt 2001; Weingart 2001). Not only an obvious hierarchy between expert and laypersons characterises this so called 'deficit model' (Wynne 1992), moreover we are convinced learning simply does not work that way.[4] Criticising information as an instrumentalist conceptualisation of learning processes we would argue knowledge cannot be stuffed into a passive brain but has to be acquired actively.[5] The idea behind information emphasises the role of those who provide it and at the same time ignores the contribution of those who are intended to be the receivers. We would argue that the approach of the learners—in particular an *active* approach of the learners—is crucial for learning processes. Who the learners are, what they know and what they have experienced, what their aims and values are, what they contribute to a given learning process and how they perform therein all matter a great deal. From a philosophical point of view this opposes the Cartesian concept of a universal subject of cognition. In this respect we argue with Foucault (cf. 1987: 290–291) that the subject of cognition is not a universal, but a specific one.

For this reason our explicit aim was to overcome the instrumentalism of information and thus to organise interactive learning environments in our project. Accordingly our workshops were rather small with respect to the number of participants, but, in return, learning processes became possible, which understood the participants not only as passive recipients, but rather as active partners in a dialogue.

An opportunity for research

A second part of our project consisted of a research undertaking. We took the given situation of learning processes on genetic engineering as a research opportunity. In addition to our educational enterprise we wanted to shed more light on the background of such processes where people try to learn more about genetic engineering. Some results of this research will be introduced below.

Setting

First it should be pointed out that this study does not reflect a representative sample of the Austrian or Styrian population. The participants of the workshops, which were the group under investigation, have an above average interest in the subject of genetic engineering and they are highly motivated to learn more about this topic. We can conclude this from the fact that it requires considerable motivation to come to a workshop which lasts for more than four hours after work or at the weekend. These circumstances are very restricting if one tries to apply models aiming at a public dialogue on science and technology. The method we used was a standardised questionnaire, which we distributed among the workshop participants. Given the fact that about half of our questionnaires were returned (from 200 participants) the total population was rather small for a statistical analysis. In order to make our data more valid they will be substantiated through a comparison with other studies.

The knowledge-acceptance assumption

We may ask the premise question of why the public should learn more about genetic engineering. In fact there are many answers to this question and most of them sound very ethical. However, it can be said that one of the driving forces behind public information campaigns is the relatively low acceptance of genetic engineering.

It has been assumed that resistance to genetic engineering results from a lack of knowledge and thus a better understanding of the subject should be the cure for acceptability problems (see e.g. Wynne's critical analysis on this assumption 1995: 369 or Pfister, Böhm and Jungermann 1999: 170). Statements such as: 'If only everyone knew what scientists know, there would be no resistance to genetic engineering', are familiar to us. Despite the motives—whatever they may be—that lie behind the numerous efforts to solve acceptance problems we can examine the question of the relationship between knowledge about and attitudes towards genetic engineering.

In accordance with other international studies (Hampel and Renn 1998: 387; Weingart 2001: 247) we found little evidence for a correlation in this matter. Rather, more knowledge tends to lead to more differentiated attitudes. 'Whereas most surveys assume knowledge or understanding to correlate positively with attitude' (Wynne 1995: 369). In other words, people who claim that they know more about genetic engineering are likely to find positive *and* negative aspects related to its application in agriculture and food production. Many studies have shown that most people assess genetic engineering ambivalently (cf. Pfister, Böhm and Jungermann 1999: 172, 192). On an international level it can be shown that countries with relatively high knowledge about genetic engineering such as the Danes do not necessarily support genetic engineering much more than the Austrians, who are distinguished by their comparably low level of knowledge on the subject. The Portuguese on the other hand do not know much either, but they seem to be less concerned than Austrians or Danes (cf. Eurobarometer 46.1: 13, 26).

Risk

Regarding the 'knowledge-acceptance assumption' the category of risk plays a specific role. The assumption presupposes that: first, people are mainly sceptical, because they *think* genetic engineering is (too) risky, and second, the opinion that genetic engineering is a risky technology is a false or at least exaggerated belief. Thus, if the public got the 'right kind of information' (scientifically proven of course), their risk perception would become more 'realistic' and the resistance against genetic engineering would evaporate automatically. Again information (data) is understood to be the appropriate means to solve acceptance problems and there is an unswerving trust in the power of human cognition, i.e. that risk assessment is a strictly knowledge related issue.

According to psychological studies, knowledge related factors do indeed exercise some influence on the assessment of risk, but only a very modest one (cf. Jungermann 1982: 222). However, what is even more important, people's estimation of risk potentials is apparently not the only factor that influences their attitude towards genetic engineering. There is only a very low correlation between knowledge and public assessment of genetic engineering (cf. Pfister, Böhm and Jungermann 1999: 195). Not least for this reason information (data) oriented strategies have only a limited potential to increase acceptance.

In conclusion, cognitive factors may contribute to people's attitudes towards genetic engineering, but they certainly do not play a mono-causal determinate role. And certainly more knowledge on the subject does not lead automatically to more acceptance of genetic engineering. With Jürgen Hampel and Uwe Pfenning (1999: 50–51) we can say that a causal and universally valid model for attitudes toward genetic engineering does not exist in social science (yet). This is particularly true if those attitudes are differentiated or ambivalent as they actually are.

Interestingly enough participants of our workshops who said they knew *little* about genetic engineering were more optimistic about the benefits of GMOs than those who claimed they knew more about the issue. Although little support can be found from empirical data, the information-deficit argument, which is based on the assumption that more knowledge leads to more acceptance, is still quite popular.

Popular as the call for more information is, however—because information is always good—it is equally common to blame the media for a lack of acceptance even though they are ambitious to provide information—because it is always their fault.[6] This is despite the fact that it remains completely unclear what kind of information is considered to be right and which conclusions people are expected to draw. Furthermore we can question whether the critique that information provided by the media does not automatically lead to more acceptance admitted that different people might possibly arrive at different conclusions on the same issue, even when they share the same knowledge and information.

The emotional dimension

We also investigated emotional aspects related to genetic engineering in our study. As we could see that knowledge does not exercise a determining influence on people's attitudes one could ask if emotions did. Some might argue that this is the case. At times this is expressed through ironic comments like: 'The Austrian attitude is a gut attitude' as Helge Torgersen (1996: 50) from the Institute for Technology Assessment in Vienna puts it. For methodological reasons we couldn't draw a *causality* from our data, but we saw that participants who disapprove of genetic engineering also very often indicate negative feelings.

Introducing the emotions into a discourse is often mistaken for irrationality. However, it seems rather shortsighted to discredit fears and feelings of unease towards genetic engineering. Such feelings will not disappear by simply ignoring them. The participants of our workshops not only showed a strong emotional discomfort, they could give reasons for this, too. They are particularly suspicious of large companies, which are seen as beneficiaries at the expense of consumers, local producers and small businesses. About 85% of the participants share this concern. The same proportion of people fear misuse related to genetic engineering. The figure by the way is higher than that of the participants' risk perception: 70% perceive genetic engineering as a risky technology.

It should be emphasised that we do not understand emotions and reasoning as a mutually exclusive and antagonistic dichotomy. With Brian Wynne (cf. 1995, 1996) we would argue that what is commonly identified as 'fears', are in fact rational reactions to past experiences and past learning. This does not mean that one should identify feelings with cognitive processes, my point is to take emotional aspects into serious consideration and not disqualify them as irrational.

Trust and credibility

Trust and credibility play a major role in respect to genetic engineering. This is particularly true for related learning processes. 'Nevertheless, the trust dimension has been shown to be critical, and often neglected, whether its practical manifestations are toward apparent public acceptance or rejection of science' (Wynne 1995: 378). How dramatic this neglect is becomes clear if one keeps in mind that most people do not trust their own main sources of information, namely the media. Moreover the chief agents in the debate on genetic engineering such as politicians, representatives of industry and journalists have a very low credibility (cf. Eurobarometer 46.1: 70). Environmentalists (and to a certain extent scientists as well) on the other hand are a group that enjoys much higher trust, as we learned from our data. But it is not only the reputation and background of a person that matters when he or she talks about genetic engineering. What is equally important is the setting of the learning situation. Not surprisingly, direct face-to-face interaction—such as our workshops made possible—is much more suitable to establish a trustful communication than a mediated one-way information process would be.

Taken together we can see that attitudes towards genetic engineering are not simply a matter of the availability or accessibility of information (data) and thus to simply *providing* some, would appear to be necessary, but certainly not sufficient to deal with people's concerns about genetic engineering in a constructive way.

Learning for participation

In the next section of this article I would like to go beyond our concrete project (the workshops and the associated study) and discuss learning processes on genetic engineering on a more general level. Apart from the question, whether or not information or learning might change people's opinions on a given subject we can ask what role they play according to people's behaviour. By doing so I will address a general technology policy aim of democratising design processes which is high up on the STS agenda. In this context the category of public participation becomes crucial and this is what I have in mind talking about action. Of course one could say learning itself is an activity and acceptance is also linked to some sort of action, if it is only to buy certain products, to vote in a certain way or at least to refrain from resistance. However, what I am more interested in is social action, behaviour that can be understood as a participatory activity.

Obviously participation is not compatible with all political agendas and it is certainly different from acceptance, which could also be associated with the opposite of participation, namely to remain passive. However, the argument I would like to outline does not only contain this political dimension, but an educational one, too.

Four learning principles

As already mentioned many STS researchers have drawn attention to their critique of learning processes following the so called 'deficit model': approaches which understand learning as a process of information transfer from 'experts' to 'lay persons'. In contrast to such instrumental concepts they suggest an interactive understanding of learning processes. This is mostly referred to as a dialogue model. Four learning principles are central to this dialogue approach: The stress on (1) *interaction* emphasises that learning is mutual and meaning is co-constructed. Furthermore many STS researchers highlight the importance of (2) *experiences* in the course of the learning process, a relation to (3) *everyday life* and (4) concrete opportunities for *action* for the learners (cf. Schallies and Wennensiek 1995: 20).

As convincing as such approaches may be, as difficult it seems to put these four learning principles into practice; especially when these learning processes address adults. Many encouraging examples can be found in the field of teaching in school, where attempts are made to apply interactive and experiential learning processes relating to everyday life and focussing on concrete opportunities for action. But schooling will mainly reach children and not their parents. Indeed we know that many grown-ups are only accessible for such learning processes through their children as they visit science centres with them or participate in science weeks. Adults stick to modes of learning which most often lack such interactive qualities and there are not many opportunities available where adults could actually enter interactive and experiential learning processes relating to everyday life and focussing on concrete opportunities for action. Thus, the media remain the source of information number one for adults.

Coming back to the case of modern biotechnology it appears to be quite challenging to apply these four learning principles in this context. Not only that learning processes from an STS point of view go far beyond everything that can be appropriately called information, opportunities for individual action and participation in the shaping of modern biotechnology remain out of sight for most people. This could be understood as a handicap for applying the four principles mentioned with relation to modern biotechnology. For this reason, in the concluding section of this paper, I would like to discuss what it could mean to put the four principles into concrete learning practice and whether they open up a perspective to overcome the criticised information paradigm.

(1) *Interaction*: How can we organise processes where people can enter a dialogue with the creators of modern biotechnology? The challenge

would be to make engineers and managers listen to the concerns of the public rather then getting their views across. Or as Ulrike Felt put it, to contribute to scientists' understanding of the public (cf. Felt 2001: 21). In times of globalisation and supra-national democracies it is not easy to explain what we mean by a broad dialogue with the public. Technically it is hard to imagine how 370 million consumers in the EU alone should enter into this dialogue. We quickly arrive at some sort of representation which goes together with the media that are supposed to do the job of dissemination. Let us not mislead ourselves: it is not a broad public dialogue if people watch a talk show in TV or read letters to the editor (which are sometimes fake anyway) in a newspaper. It would be helpful if people could find an ear to which they can address their concerns. Of course it is crucial that they should also experience that the ear is really listening to what it is being told.

(2) *Experience*: The category of experience is crucial for learning processes from an STS point of view. But, aren't genes too small to see and too abstract to grasp? Genetic engineering cannot be experienced directly, at best only its products or procedures (cf. Pfister, Böhm and Jungermann 1999: 171). Apparently we cannot play with them and thereby find out how they function as an 'experiential pedagogy' or a 'learning by doing' in Deweyian (1916) terms taken literally might suggest. What could experience mean then? It seems that what matters are experiences people have with their learning processes and not so much whether they mix certain chemicals together or have once been able to look through a microscope or not. According to Matthias Finger it is important that people find an opportunity to derive meaning from what they learn (cf. 1994: 144). Meaning can be created if learning opens up concrete opportunities for individual action or if it can be related to significant life experiences. To conclude, if learning processes on genetic engineering were to become more experience oriented it would help if the scope of experiences was increased and related to people's lives.

(3) *Everyday life*: If we ask how genetic engineering could become an everyday experience one could answer: it already has been for many years.

This is particularly true for genetically engineered enzymes as they are applied in washing powder and food additives as well as in the pharmaceutical industry. Of course it can be asked whether the general public knows about this or not. However, there is a significant difference whether this relation to everyday life meant the existence of more or less completed applications or if this relation included practices that are open for individual shaping processes. Genetic engineering would appear to be rather distant from people's lives even though it has already quietly entered their households. Today it is no longer necessary to know how technologies function in order to use them, information technology is a prominent example of this fact. As for modern biotechnology, the applications of genetic engineering are often not visible and for its users it is not even necessary to know that one actually uses them. Thus, a relation to people's everyday lives does not help per se. It will only be fruitful for learning processes as it includes individual experiences and practices. Again this emphasises the significance of concrete opportunities for action.

(4) *Action*: It is not easy to point out where people have opportunities for action in relation to modern biotechnology. Especially if these options are meant to go beyond the alternative to say 'yes' or 'no' to applications of genetic engineering which can be found on the shelves of a supermarket. If we understand concrete individual action as opportunities for participation in the processes of developing, designing and shaping of modern biotechnology our answers may sound a little idealistic. The challenge will be to show where they actually are, how to join such concrete practices and to which outcomes they (may) lead. Over the last two decades a variety of strategies has been developed aiming at a better integration of the public in technology related design and decision-making processes. Citizen panels, consensus conferences, and participative technology assessment are the most well known examples and have been employed in several countries. On the basis of experiences with such approaches we can evaluate whether they are suitable for democratising technology development processes and if they open up concrete opportunities for action in connection with modern biotechnology.

Conclusion: From rejection to shaping

Much of what makes the case of modern biotechnology a particularly difficult one has to do with its controversial character. The debate is caught in the dichotomy 'prevent versus push through'. Although it has been pointed out that the public has a differentiated attitude towards genetic engineering—medical applications have a far higher acceptance than agricultural ones do—the categories which are negotiated are still acceptance and rejection. In other words the public debate has not arrived at issues of shaping, yet. Consequently participatory design processes are not on the agenda and neither are opportunities for individual agency (except for protest behaviour and consumer decisions). Inevitably we encounter the question, whether talking about 'shaping' implicitly includes a 'yes' to modern biotechnology. It seems that the learning principles discussed above are only applicable if this decision has already been taken. But how could learning processes keep the decision itself open? The challenge is that a democratic society endeavours to ensure learning processes on genetic engineering where people can draw different conclusions—no matter how challenging their implementation might initially appear.

The introduction of educational principles made learning processes on genetic engineering look like a quite difficult job. To make this task more feasible I'd like to suggest to reflect on another commonly proposed STS postulate, which is mostly referred to as 'technology push versus demand pull'. Indeed many difficulties outlined above appear in a different light as one focuses on the needs rather than on the technology. If we focus on the problem of how we want to feed ourselves instead of discussing the application of genetic engineering in agriculture and food production we might find ourselves in a different discussion and possibly the learning processes we think are required may also be different. Furthermore it can be argued that it is a lot easier to say how people find an opportunity for concrete action in their everyday life and learning is experience oriented as the issue is feeding and not GMOs. Needless to say that there is little doubt that we learn how to feed ourselves through interactive processes from the day we are born. Furthermore, whether one thinks that genetic engineering is a technology that should (or could) be used in the context of food production or not remains an open decision if we follow a problem based as opposed to a technology centred approach.

Finally, with regard to 'demand pull' we could ask whose demand it was that mattered, how we knew about it and how we could express our needs. In other words we would need to explicate how we understand democracy in general and participation in particular. These are of course issues that require more than a sentence or two. But, behind the concept of 'demand pull' there is the idea of participation and doubtlessly this questions the 'deficit model'. It questions whether 'experts' necessarily know about the needs of 'laypersons' better than they do themselves. Instead of trying to get across what certain technologies are good for, the challenge is to involve users in design and citizens in decision-making processes. This puts a strong emphasis on the significance of those who are often conceptualised as 'lay' persons or 'receivers' of information. And of course this requires dialogue rather than an information campaign.

After all, I should say I am not over optimistic that all problems related to modern biotechnology can be solved through learning processes, even if they follow a demand pull approach and are organised as interactive and experiential learning processes relating to everyday life and focussing on concrete opportunities for action. Neither do I think that there is an ultimate learning model. But I am convinced that it is a worthwhile undertaking to critically discuss how participatory learning processes can be put into practice, which open up concrete opportunities for action and contribute to a democratisation of the technology development.

Notes

1 Styria is one of nine Austrian provinces. The project 'Informationsoffensive zur Gentechnologie' this article is referring to was funded by the government of the province of Styria.

2 I will use the term 'information' in its common sense meaning, even though, against the backdrop of a constructivist understanding, information is somewhat

different, namely a process. Heinz von Foerster (cf. 1974: 196) defines information as the process of knowledge acquisition and thereby strictly distinguishes information from data. Accordingly what is called information in the public understanding of science discussion would be more appropriately described as data.

3 Others (Schneider 1996: 19) have called this the 'Paketmodell' (package model), because it suggests knowledge as an object. The acquisition of knowledge then would be simply the accumulation of data.

4 From a constructivist point of view it is only data that can be transferred, but not knowledge (cf. Sammer 2000: 58; Foerster 1970a: 83).

5 Despite the common sense understanding constructivists call this active acquisition 'information'. In other words the one who is *doing* information is the learning subject and not the one who is providing data. Knowledge would be understood as opportunity of action (cf. Foerster 1970b: 290).

6 It should be noted that according to a comparative content analysis (cf. Kohring, Görke and Ruhrman 1999) there is little evidence that the media (in Germany, France, Great Britain and the USA) would actually exaggerate risk aspects or dramatise possible effects of genetic engineering. The IFZ has carried out a media analysis of four Austrian newspapers and our results show a similar picture (cf. Wieser *et al*. 2001b). Against the backdrop of this empirical data the stereotype that the relatively low acceptance of genetic engineering is an outcome of the negative media coverage can be proven wrong.

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