Beyond Girls Can Do Anything: The Deconstruction and Reconstruction of Feminist Approaches to Science Education in New Zealand

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ABSTRACT

In New Zealand over the last 10-15 years there have been a series of policy initiatives designed to make science education more girl-friendly, that is, more inclusive of the needs of girls. I look at some of the (unintended) political effects of these interventions, arguing that policy development in this area has been hampered by the lack of a coherent theoretical basis from which to work. I suggest a framework within which science education can be re-thought a framework which incorporates recent work from feminist philosophy and from the history and philosophy of science so that the development of workable interventions on behalf of girls and women in science education becomes a realistic possibility.

Introduction

In both scholarly and popular writing on the subject of girls education it has been common to assume that girls in general are neither interested in, nor good at mathematics and science, and that this is a problem. In the last 10-15 years, a significant research literature has developed on the subject of the problem of girls and science. In response to this literature, curriculum interventions designed to address the problem have been implemented in a number of countries. In this paper, I describe some of these interventions. I then look at some of their (unintended) effects; in particular, I look at the ways in which they have constituted girls with respect to science. I argue that these effects have been produced through the location of the interventions at the intersection of a number of different (and largely incompatible) theoretical traditions. I also argue that, in order for there to be any possibility for girls (or women) to take up positions as genuinely speaking subjects within science, a radical re-theorising of the concepts of sex/gender and science is necessary. I argue that this re-
theorising will produce a radically different approach to the teaching and learning of science in schools; an approach which is based not on attempts to locate the problem of girls and science in either girls or science, but in an examination of the discursive practices that produce girls and science in particular ways.

New Zealand interventions on behalf of girls

The girls and science discourse developed from the context established by the second wave of feminist activity during the 1970s and 80s. In New Zealand, during International Women’s Year (1975), a conference on women and education (Education and the Equality of the Sexes) was held. One outcome of this conference was that the presence of sex stereotyping in education and the male bias of the curriculum were publicly identified as problem areas in the education of women. After this conference, a number of research reports on the position of women in education were commissioned by the (then) Department of Education.

One of these (Norman, 1983) reported on the problem of girls under-participation in science education. It reviewed research in the area and summarised the range of arguments that were being used to lobby for the development of interventions designed to improve the participation of girls in science. These arguments (which were to become the basis on which the discourse of girls and science developed) were as follows.

Firstly, it was argued (for wider democratic and/or social reasons) that it is important for girls to study science so that;

i. they will be able to function independently (as consumers) in the modern technological world and

ii. they will be able to take an active part in debates on wider social issues in which there is a scientific component.

Secondly, it was argued (for individual and personal reasons) that girls need to study science at school so that they do not limit their career options in the future. These arguments make the link between liberal individualism and scientific progress explicit. In order to claim a status as a fully human liberal individual, it is necessary to first develop a knowledge of, and commitment to science.

The appearance of these arguments in official Department of Education publications strengthened the acceptance of girls under-participation and achievement in science education as a problem that could (and should) be addressed by the Department of
Education. As a result the curriculum documents that were produced as part of the major review of secondary school science that took place during the mid-late 1980s in New Zealand all incorporated various elements from the developing girls and science discourse. Each of the three versions (two drafts and a final version) of the new curriculum that have been produced contain statements suggesting ways in which teachers can deal with the (by now official) problem of gender equity in their classrooms.

In the first (Ministry of Education, 1990) document it is asserted that;

- girls benefit more from science education if;
  - their teachers, boys, and other girls have high expectations for their success;
  - their experiences, concerns, interests, and opinions are valued as much as those of boys;
  - girls have positive role models of women in science;
  - non-sexist language is used;
  - teachers give as much time and attention to girls as they do to boys, and boys share the teachers, time, classroom resources, and discussion equally with girls;
  - a variety of teaching and assessment strategies is used.

In the second (Ministry of Education, 1992) version, this statement is retained, with the addition of the following:

- girls benefit more from science education when:
  - appropriate opportunities are provided for them to develop the full range of skills required for successful learning in science;
  - the language strengths and preferred co-operative learning styles of girls are recognised in the range of teaching and assessment strategies used;

In the third and final document (Ministry of Education, 1993), a similar set of statements appear, but in this document, the emphasis has shifted slightly. There is now a focus on the development of an inclusive curriculum which, it is asserted, will provide opportunities for girls to do a range of things similar to those listed above.

These documents were developed over the period of about seven years. During this time, there were major changes in the political environment in which these documents were produced. These changes have been influential in the ways in which the girls and science discourse has been taken up and developed within
official government policy documents. After its initial incorporation into official science curriculum statements, it has gradually been replaced by a more general discourse of science for all. The effect of this on classroom teachers has been that they are now required to design science programmes that are capable of meeting the needs of an expanding range of interest groups including Maori, students with special needs and students with special abilities (Gilbert, 1993). My purpose here is not however, to look at the (undoubted) effects of the various shifts in the wider political climate on the development of the discourse of girls and science, but to look at the ways in which the category girl has been produced and positioned with respect to the category science as part of the development of the discourse of girls and science.

In the following sections, I look at the different explanations that have been used to account for the problem of girls under-participation and achievement in science. I then look at the use made of these different explanations in developing political strategies on behalf of girls. Then I examine the effects of both the explanations and the political strategies on the constitution of girls with respect to science. In the final section I suggest a framework within which these issues can be re-thought in such a way that it becomes possible to develop workable interventions on behalf of girls and women in science education.

Explanations of the problem

The development of the discourse on girls and science has been characterised by a relatively indiscriminate use of a wide range of different (and largely incompatible) theoretical accounts of the reasons for the problem, and by the use of a range of different political strategies. Early accounts of the problem of girls and science using ideas drawn from liberal feminist thought argued that for girls to have any chance at all of achieving their potential as fully human liberal individuals, various compensatory measures would be necessary. Within these early accounts, if explanations for the under-achievement of girls in science were provided, it was usual to argue, using some version of socialisation theory, that girls natural and original equality with boys is disrupted as a result of their differential socialisation. The traditional feminine qualities that, it is argued, girls are encouraged to develop for example; passivity, a focus on people and relationships rather than on individual achievement and a preference for working in co-operative rather than competitive ways militate against their achievement of their rightful status as liberal individuals.
Thus strategies were devised that were designed to counter the
effects of this socialisation; strategies that would encourage
girls to be more proactive, competitive and career-focused in
order to enable them to measure up to the liberal individual
norm. The early development of the girls and science discourse
was thus characterised by a focus on helping girls compensate for
what were seen as their lacks (for example, Burns, 1984).
Later, attempts were made to argue that the problem lay not in
the way girls are constructed by society, but in deficiencies in
the way science is socially constructed for example, Burns
(1988). The solution to the problem, it was argued, lay in re-
conceptualising school science so that it would appear to be
more human, more relevant to the lives of girls, and therefore
more accessible and girl-friendly.
This produced a shift in the development of the discourse on
girls and science; a shift which incorporated elements from
arguments derived from certain strands of radical feminism. It
became common to argue that the source of the problem with girls
and science lies in a lack of recognition of the differences in
firstly, the background experiences of boys and girls, and then
later, in the central natures of boys and girls. It was argued
that girls bring background knowledge and experiences to the
study of science that are different from those brought by boys
(Burns, 1985; Bell, 1988; Department of Education, 1986); and
that these differences must not only be acknowledged, but
actively taken into account in the design of programmes for the
teaching and learning of science if girls are to be successful in
them (Ministry of Education, 1991). These arguments are based on
radical feminist arguments for the celebration and valuing rather
than denigration of what are seen as women’s essential
qualities.
Later, the idea that girls naturally have skills and abilities
that are different from boys appeared. For example, it is clearly
evident in the statement (in the 1993 science curriculum
document) that an inclusive curriculum will provide opportunities
for girls to use their language strengths and co-operative
learning skills. However, the particular skills and abilities
that are mentioned in the curriculum statement as being
characteristic of girls are also those that would be
complementary to the development of the particular kinds of
teaching and learning programmes being advocated in this
statement.

Political strategies

A range of very different political strategies is implied by each
of these different explanations for the problem of girls and
science. All of the accounts of the problem that have been
described above are however deeply embedded within a set of
assumptions which is characteristic of liberal individualist
Thus they produce political strategies which rely on assumptions such as that of the natural and original equality of all liberal individuals. However these accounts are limited by certain logical inconsistencies. In using the argument that girls need to acquire the necessary prerequisites for the achievement of true liberal individualism, an (implicit) claim is made that girls are potential liberal individuals, and as such, are (and should be treated as if they are) equal to boys. The context in which these arguments are made however, is the idea that girls need to be encouraged to take science; that for some reason they tend not to choose to take it, thereby depriving themselves of their entitlement to equality with boys. The purpose of these arguments is to provide the basis on which a second set of arguments in support of the development of interventions to encourage girls to take science at school can be made. These arguments assume girls natural and original equality with boys on the one hand, but then, on the other, implicitly construct girls as deficient in not choosing science, and in needing compensatory measures. It is difficult to claim a natural and original equality on the one hand, while claiming the necessity for compensatory measures on the other. This problem has generally been resolved through the use of the argument that the original equality of individuals is disrupted through the effects of the oppression of one group of individuals by another. This approach while appearing to deal with the problem of logic, merely tinkers with the surface features of what is a much deeper problem. Science and liberal individualism are discursively produced by assumptions that lie deep at the conceptual heart of Western post-Enlightenment thinking. They are structured by the same assumptions, and are necessarily and intimately connected with each other. Within the Western conceptual system, categories of meaning are defined through what they are not, by what they exclude. In order to understand its categories, it is necessary to know what is not included in each category, what is other to what is included for example, the meaning of the category man is given through an understanding of it as everything that is not woman; we know what science is through the exclusion of all that it isn’t; and the concept of the liberal individual only becomes possible through the existence of individuals who do not fully achieve this status. For this reason, it was inevitable that, when the assumptions of liberal individual politics are used to make claims for equality for women in science, the end result will be for women to be constructed as somehow deficient, as lacking the essential something which is necessary to successfully participate in the discipline of science (as well as in the public/political sphere) (Walkerdine, 1989b). To be a member of the category woman, by
definition, means to be excluded from membership of the category scientist, or of the category liberal individual. These assumptions are deeply embedded features of modern Western thinking. Any approach which uses only the surface features of an unexamined liberal individualism can never be anything other than ineffectual as a strategy for producing real change (Yeatman, 1988).

Later attempts to account for the problem of girls and science were not characterised by arguments for equality for girls, but by arguments in support of the recognition of differences between boys and girls in their socialisation and then later in their essential natures. However this approach also has problems.

Firstly, the effect of these arguments, whether or not they claim an essential/natural difference or merely differences in socialisation, has been to establish an identity category for girls within science education that is qualitatively different from that already established for boys. This functions - not to disrupt the already established binary opposition between boys/girls and men/women - but to support it. In the conceptual system which is at the basis of modern Western thought, the category boy is already strongly linked with that of scientist, and with the notion of the (potential) liberal individual. The creation of another different category for girl within science education is to invite (and contribute to) its exclusion from the category scientist and also ultimately from that of the liberal individual (Yeatman, 1994). It sets the scene for claims to be made for the recognition of the needs of a whole new set of identity categories - Maori students, gifted students, students with special needs, gay/lesbian students and so on - claims which, for reasons already outlined, are unlikely to be successful, and which produce the fragmentary politics which characterise the notion of an inclusive curriculum. A necessary feature of the creation of these extra categories is the talking up of certain features of girlness, and the suppression of certain other features (those associated with boyness). The result of this is that the features of girlness are naturalised, coming to be seen as fundamentally different from boyness.

Secondly, it becomes logically impossible within the political environment of liberal individualism for one group of individuals to claim a fundamental equality between itself and another group from which it has already claimed to be very different (Ranciere, 1992). Since claims to equality are the main basis on which arguments against injustice can be made within liberal individualism, claims made by groups on the basis of difference are effectively de-politicised.

In this situation, it is really only possible to make arguments
that either draw on the concept of oppression, or that support solutions based on political separatism. Neither of these strategies seem to me to be capable of contributing to the development of the possibility that girls and women might be able to take up positions as genuinely speaking subjects; firstly within science education, and then within science.

A framework for the future

It seems to me that the source of the problem of girls and science does not lie in some lack in girls, but nor does it necessarily lie in science itself. Rather it lies in the nature of the discursive practices that produce girls and science in particular ways, in the unacknowledged and unexamined assumptions that lie beneath these practices (Walkerdine, 1984; 1989a; 1989b). I think that, if there is such a thing as a solution to a problem like this, it will lie in finding ways to describe these discursive practices, and then to think differently about them. I think we need to find ways to use the category girl and the category science, but at the same time to call them into question, refusing certain of their features. In this way the boundaries of the categories can remain permeable; the meaning of each category can be prevented from solidifying; indefinitely deferring it (Fuss, 1989).

To do this, a certain amount of theoretical groundwork needs to be done. I think that there needs to be a re-thinking of the concept of sex/gender and of the concept of science; of the interaction between them and between them and education. This is the basis of my doctoral thesis. I think that this work will produce the possibility of establishing a different political environment within science education an environment that focuses on the idea of difference in general - or specificity (Phelan, 1991) - rather than on the establishment of fixed identity categories which are then forced to compete with each other for limited resources.

Dealing with difference in science education should not mean attempting to provide appropriate forms of science education for an ever-increasing number of different interest groups. A much more productive approach is, in my view, to develop science curriculum materials which take a deconstructive approach to the knowledge and methods of science, and to the social and political location of science itself. By this, I mean an approach in which scientific knowledge is used and understood, but in which it is simultaneously deconstructed and used strategically. Within this approach, as students develop their understanding and ability to use scientific knowledge, they will also be developing their own critique of it, and of its intellectual, social and political origins. It is clear that scientific knowledge is powerful and
useful, and that all students no matter what identity category they locate themselves in need an understanding of scientific knowledge. However it is also clear that scientific knowledge is partial and situated knowledge (Haraway, 1991), and that students need to be helped to find ways to locate themselves with respect to it, to understand it and its origins, and to develop their own critique of it. Approaches to the problem of girls and science education which either reject science out of hand, or which constitute girls as either deficient or different, serve only to contribute further to the impossibility of girls real participation in the discipline of science as genuinely speaking subjects.

References


