THE OBSERVATION AND ANALYSIS OF CURRICULUM DECISION-MAKING IN A NATIONAL CHEMISTRY EDUCATION MATERIALS PROJECT

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This paper describes the purposes and general methodology of an ongoing case study of a national project in chemistry education materials development. The study, which was funded by the now disbanded Educational Research and Development Committee (ERDC) at the end of 1980, is examining and documenting the planning and developmental work of the Australian Academy of Science School Chemistry Project.[1] This project is engaged, as a nationally representative undertaking in the preparation of written materials including text and student activities together with a supporting guide for the teacher. The materials are intended as a complete course of study to fit the Academy's recently promoted syllabus recommendations (Australian Academy of Science, 1979). Through these recommendations and the forthcoming course materials, the Academy hopes to stimulate substantial changes in the approaches and content of chemistry teaching in the secondary schools.

National projects of the scope of the School Chemistry Project have the potential for making a significant impact on the quality of education in the schools. But while there have been a number of undertakings of this sort over the past decade or so in this country, little has been recorded of the dynamics of their design processes or the ways that decisions were taken and implemented during the development work. Significantly, there exists no systematic account of the design and deliberative processes used within the Academy's earlier -- and highly influential -- Web of Life project in school biology. Yet, it is clear that the success of that project, both in terms of its organisation and its ultimate market penetration, has been a major factor in the Academy's decision to extend its interest and leadership to other school subject areas. Whether or not the subsequent Academy projects can achieve comparable influence may well depend on the clarity of direction they can bring to their development work, and on the extent to which they are in a position to profit from lessons learned in earlier projects.

The difficulties, for instance, of achieving a working consensus on purposes and procedures in any team-based curriculum work are formidable. This is particularly so when the project is attempting to break new ground and where the need for the team to develop a common sense of purpose and direction is crucial. Certainly, there is need for considerable organisation, cooperation and negotiation at all stages if the work is to be coherent and manageable. If sensitively documented and portrayed, the experiences of those who have managed or worked on teams preparing innovative curricula should provide a valuable resource for others planning a similar undertaking. It was with this principally in mind that the case study of the School Chemistry Project was originally proposed.

This paper outlines the main purposes and scope of the case study[2] and discusses the approach being used to capture the design strategies and decision-making processes of the School Chemistry Project. Since the case study is still in progress, and because the observation and coding systems are still somewhat tentative, the emphasis is on the methods and theoretical orientation of the study rather than on substantive findings. However, the paper does consider some aspects of the School Chemistry Project which

have influenced the initial design and development strategies adopted by the writing team.

The School Chemistry Project

The origins of the project can be traced to the early 1970s when the Academy first considered involving itself in the preparation of teaching materials for secondary school chemistry. Its more decisive antecedents, however, were the Academy's national survey of chemistry education at the matriculation level (Simpson, 1976), the subsequent preparation and distribution of a draft version of the syllabus recommendations in 1977, and a programme of visits to all States early in 1979 to assess reaction to the draft recommendations.

With few exceptions, support for the proposed form and content of the syllabus appeared to be positive and broadly based both at school and tertiary levels. Indeed, there were indications of potentially strong demand for a new textbook based on the Academy proposals, particularly in States where existing syllabuses were under review and where the available texts were not particularly well suited to the emerging needs.

On the basis of this support, the Academy decided in 1979 to commit itself to the preparation of student text and associated materials to match the philosophy and content of the syllabus outline. Work on the preparation of materials began later that year with the formation of a formal Management Committee, the appointment of the Director and Assistant Director for the project, and the assembly of an ongoing editorial panel.[3] Ultimate control and authority for the project resides with the Management Committee and the Academy, but the detail work of curriculum design and materials production and the day-to-day management of the project are the responsibility of the editorial panel and its small secretariat.

The editorial panel includes, in addition to the Director and Assistant Director, a number of academic chemists and senior school chemistry teachers from different States and the Australian Capital Territory. The panel meets three or four times a year for planning and writing sessions at different locations around Australia. Where appropriate, members of the editorial panel provide coordination and liaison for local writing teams working in their regions.

As the sole sponsoring body, the Academy provides for all direct costs of the project. These include the maintenance of the secretariat, national meeting costs for all participants, honoraria to externally commissioned writers where appropriate, and ongoing development costs generally. Clearly, these costs represent a substantial outlay and commitment, particularly since the Academy must rely on the prospect of sales of published materials at a later stage to recoup costs. Nevertheless, compared with some other large-scale Australian curriculum projects of recent years (such as the federally funded ASEP and SEMP projects of the Curriculum Development Centre), the School Chemistry Project is quite modestly resourced. A considerable portion of the writing and redrafting of the materials, for instance, is done on an invited basis by interested teachers and academic chemists working largely in their own time. Moreover, apart from the Assistant Director and a part-time secretary who together make up the project's secretariat, none of the other editorial panel members occupies a staff position with the project. Though the Assistant Director has been seconded as full-time manager and executive editor of the project, the Project Director and all other members of the editorial panel have full-time professional commitments

independent of their work on the project team.

Most of the coordination and management of the project, and much of the writing and revision of drafts, naturally occurs between the project's national meetings of the editorial panel. However, few policy decisions are taken unilaterally outside the editorial panel, and the project relies heavily on the national meetings for its ongoing planning and review work. The interactive discussions and deliberations of these meetings effectively shape the evolving materials in terms of structure, content, and sequence of presentation. Because so much of the design work and decision-making of the project takes place within the editorial panel, these national meetings are of primary significance to the case study.

The School Chemistry Project was originally scheduled to complete its writing phase in time for the first commercially printed materials to be made available to schools before the 1983 school year. As it happened, the generation and field testing of the various modules of the course materials have taken somewhat longer than planned. It is now expected that the final published version of the materials will be available for purchase by schools in time for the start of 1984. Interim versions of sections of the materials are being distributed to a sample of schools for field testing this year, and it is planned to continue this process with drafts of subsequent sections during the remainder of the development phase.

The Case Study

The case study commenced in December 1980, a little more than a year (and three national meetings) after the School Chemistry Project began its formal design work. Since that time, one of the researchers has been present at three national meetings of the project. Taped recordings of the initial project meetings have also been made available for transcription and analysis, and full access has been given to the project's files and to records of the Management Committee.

Basically, the study is aiming to reconstruct the origins and founding purposes of the School Chemistry Project and to document the subsequent activities of the management, editorial and writing teams. Its purpose is to provide a record of the project's rationale and objectives, the context in which it emerged, the general design and development strategies being used, and the kinds of the decision-making structures that have emerged. At the same time, the study is seeking to infer the underlying curriculum model being used by the project and to determine the design principles which direct the work of the team. Though some of this can be gleaned from reports and other statements from the project, much is inevitably implicit and has to be inferred from careful observation of the project in action. Of main interest are the project's underlying motivation, its curriculum priorities and intentions, the principles it applies to the selection and arrangement of content, and the ways each of these directs or constrains the development process. As part of this, the study is looking at the extent to which the team members have developed a common sense of purpose and direction, the ways this has occurred, and the manner in which perceptions about purpose and direction have influenced planning and decision-making in the writing and editing phases.

For reconstructing the context and history of the project, emphasis has been placed on (a) the examination and interpretation of relevant chemistry education literature of the time, (b) detailed analysis of project records and publications from the Academy and senior members of the project team, and (c) a series of interviews with individuals connected to the project and with others involved in various

capacities with State-level committees and examining panels. To date, the case study team has completed one round of interviews in South Australia, Victoria and New South Wales. It is still intended, uncertain funds permitting,[4] to revisit these States during 1982, at which time the interview interpretations will be validated and up-dated where necessary.

As far as the early history is concerned, the study is obviously at some disadvantage because of the lateness of its start in relation to the project itself. This is offset to some extent, however, by the availability of records of the Academy and Management Committee meetings, and the team's ready access to the individuals who figured most prominently in the emergence and shaping of the project up to 1979.[5] Among the available records are the minutes of the interim project committee which met on an irregular basis between 1973 and 1979 to initiate the Simpson survey and ultimately to draw up specifications for the project and editorial panel. Much of the rationale and broad directions intended for the project are discussed at various levels in these and other formal statements from the Academy at the time.

Framework for Analysing Curriculum Development Processes

While most of the prescriptive theory and a good deal of conventional wisdom in the curriculum field continues to assume the ideal of a rational-scientific or systems model of development, there is evidence that what developers commonly do in practice is not satisfactorily described by such a model. Stenhouse (1975), for example, has stressed the lack of fit these rational formulations typically provide for the kinds of situational problem-solving that characterises curriculum work in the natural context of classrooms and schools. More to the point, perhaps, are the findings of Decker Walker (1971, 1975) who has documented the processes and tactics used in natural settings by syllabus committees and some formal projects in the organisation and direction of their design work. In Walker's view, these naturalistic processes and tactics are essentially political and intuitive, being rooted in concrete problems and the participants' collective practical knowledge rather than in a deductive scientific ideal.

The model he advances puts emphasis on the dynamics of group negotiation and the nature and function of what he calls practical reasoning. According to Walker, the intellectual heart of naturalistic development consist typically of

> . . . practical reasoning or deliberation during which problems (are) identified, formulated, and stated; proposals for the resolution of these problems (are) conceived and articulated; and arguments (are) offered for and against the proposals and formulations of the problems (1975, p.132).

Deliberation, in this view, is not a matter of deducing the form of curriculum directly from a set of pre-specified objectives or from the essential features of the subject matter and presumed needs of the students. Instead, the criteria for resolving particular issues, and the sources of ideas or solutions to practical problems, typically derive from the experience of the curriculum team. Appeals are seldom made to what might be looked on as a higher-order theory of curriculum design or to the logic of a systems approach. Rather, the process of development is often largely intuitive and more a creative activity than an applied science; it relies more on subject matter expertise and on the imagination, practical experiences and shared convictions of the developers than it does on pre-specification and mechanistic rules.

But to suggest that the process is intuitive and creative rather than scientific does not mean that it need be adventitious or undisciplined. Nor does it imply that the product will be simply an expression of personal preferences, unexamined prejudices or group socialisation within the team.

Inherent in Walker's conception is a distinctive kind of rationality: a rationality disciplined by practical rather than theory-driven reasoning, a rationality concerned more with recognising what can be defended in the context of a particular problem than with deducing means from ends alone.

It is unlikely that many projects would embody exclusively a naturalistic approach. More probably there will be elements of both naturalistic and scientific paradigms, so that differences between projects will be in terms of degree or relative balance. For some aspects, or at some stages, a project may well conform to the traditional prescriptions; but where the ends are less clear or where the merits of competing means are problemmatic one might expect to find greater reliance on practical argument and deliberation.

Which of the naturalistic or scientific paradigms or some combination of them is the most appropriate to describe the developmental processes within the School Chemistry Project remains to be seen. However, because the majority of those involved in the project are practitioners with considerable expertise in the subject matter of the Chemistry discipline, and because the model for guiding the production of materials is intentionally collaborative and to a large degree democratic, it is a reasonable hypothesis for this study that the curriculum process involved will fit closely the naturalistic model.

To explore this hypothesis meaningfully it is necessary to consider deliberation in relation to the other parts of Walker's model. Essentially, the naturalistic model consists of three elements: the curriculum's platform, its design, and the deliberation associated with it (Walker, 1971, p.52). Platform, as Walker uses the term, refers to the system of beliefs and values the curriculum developer brings to his task and which both guide the process and shape the final product. For the developer, the platform involves both a notion of what is, and a vision of what ought to be. These notions and visions, whether explicit or otherwise, provide the general direction for the project and the basic rationale for the kind of curriculum being advocated.

But Walker (1975, p.107) has found that the translation of platform into curriculum materials and learning experiences is seldom straightforward. In the first place, the developer's sense of platform tends to be only partly articulated at the outset, and many of its basic concepts and principles are often vague and imprecise. Secondly, there are frequently latent contradictions or conflicting tendencies in the initial platform which only appear when the consequences of the different principles are set against each other in the context of a particular decision problem. Moreover, it is apparently uncommon for the developer to be able to anticipate all of the principles and criteria needed to resolve the various practical issues that arise in the development work. Typically, then, one would expect the elaboration and refinement of platform to proceed more or less continuously throughout the active stages of a project. Presumably, a good deal of what exists initially as implicit or unarticulated platform will become explicit as working principles are established to deal with particular practical problems. The process by which this refinement and articulation of platform is effected is part of what Walker terms deliberation.

The third element of the model is the design of the curriculum created by the project. By 'design' Walker is referring not to the plan for the materials or even the material products themselves, but to the educationally significant features of the curriculum as it will be experienced by the learners. Whether or not the material products will embody the kinds of design features envisaged by the project's

platform, will depend upon the efficacy of the deliberation processes.

Platform and design are thus the two substantive components of the model; deliberation is the process by which principles of platform become translated into operational curriculum.

Walker (1971, p.56) has done considerable work on the conceptualisation of platform and its sub-elements, and also on the functions these various parts have in setting parameters for the deliberation process. Similarly, the nature of deliberation has been carefully documented in a variety of projects, and a number of what appear to be generalisable or generic tactics have been identified (Walker, 1975, p.112-119).

Transcripts from selected meetings of the School Chemistry Project are currently being analysed to assess the extent to which Walker's concept of deliberation reflects the development logic of the writing and editorial team. Through interview analysis, key elements of the project's platform are being inferred and checked for validity and completeness. The analysis of transcripts will provide an opportunity to test Walker's findings in a different context. However, along with this theoretical concern, the case study is also interested in the special characteristics of the School Chemistry Project as a project in its own right. The identification of platform and the analysis of decisions made during the work of the project will provide a major part of the data for documenting the history and development of this innovation.

Concluding Remarks

The case study was originally intended to continue until the project completed its writing phase and the materials were prepared for publication toward the end of 1982. Since the project itself now expects that stage to be reached sometime in 1983, the time line for the case study will be extended accordingly. The final report is therefore unlikely to be available much before the middle of 1984. It may be appropriate, however, for some further discussion of the methodology and analytical frameworks to be published separately from, and in advance of, the main report, although no substantive findings will be reported before the conclusion of the project.

The final report of the study will be a case history of the project from its conception and formal beginnings, through to the development and eventual publication of the materials. Because of time constraints, the study will not include more than an incidental focus on the subsequent dissemination and implementation phases of the innovation. Yet these aspects may well be of critical importance for the project and the impact the materials will have in the schools. A study of the dissemination stages and the pattern of adoption of the course materials by chemistry teachers would obviously make an interesting follow-up, and would allow the case history to be interpreted in the context of the Academy's overall objectives and strategies for change in this area of the school science curriculum.

NOTES:

1. The case study is being carried out in conjunction with a formative evaluation study by Renato Schibeci and Ralph Straton of Murdoch University. Though both studies are concerned with the overall impact of the School Chemistry Project, the 'Schibeci and Straton study' is looking specifically at (a) the effectiveness of the materials as they are field-tested in the project's trial schools, and (b) changes which occur in teachers as a result of working with the materials.

2. The case study team comprises the present authors and Mrs Jean Clark, a part-time research assistant. The study is being carried out as a project of the Centre for the Study of Teaching, a research unit of the Faculty of Education, WAIT.

3. Dr Bob Bucat, of the Chemistry Department at the University of Western Australia is Assistant Director of the project. Dr Don Watts (formerly of the University of Western Australia), Director of the Western Australian Institute of Technology, is Project Director. Professor A. Cole, University of Western Australia and Fellow of the Australian Academy of Science, is Chairman of the Management Committee.

4. With the demise of the ERDC, the anticipated funding to continue the case study through 1982 is unlikely to be available.

5. Key personnel at that stage included Professor R. Brown, FAA, Monash University; Professor A. Cole, FAA; Professor Sir Noel Bayliss, FAA, University of W.A.; and Professor D. Watts.

REFERENCES

Australian Academy of Science. Chemistry for Australian Secondary School Students, Report No.23, Canberra: Australian Academy of Science, 1979.

Simpson, P. The Teaching of Chemistry in Years 11 and 12 of Secondary Schools in Australia. A commissioned report to the Council of the Australian Academy of Science. Unpublished mimeograph, March, 1976.

Stenhouse, L. An Introduction to Curriculum Research and Development. London: Heinemann, 1975.

Walker, D.F. 'A naturalistic model for curriculum development.' School Review, 80, 1971, 51-65.

Walker, D.F. 'Curriculum development in an art project.' In W.A. Reid and D.F. Walker (Eds), Case Studies in Curriculum Change. London: Routledge and Kegan Paul, 1975.