

Community Expectations of Numeracy in Schools

Sid Bourke

Australian Council for Educational Research

Background and Context

The Australian Studies in School Performance (ASSP) project was set up in 1975 to measure the reading, writing and number work performances of 10- and 14-year-old students in normal schooling throughout Australia. The results of that study have been reported by Bourke and Keeves (1977) and the actual tasks tested and items used have been published (Bourke and Lewis, 1976). The purposes of the project and the methodology used in selecting tasks and writing test items have been described in detail by Keeves and Bourke (1976: 6-10 and 25-34). In summary, the methodology consisted of the use of a number of expert panels, consisting of teacher educators, educational researchers and representatives of State Departments of Education, to decide which tasks should be tested and which were the most appropriate items to test the selected tasks. It is relevant here to mention that a rationale for the development of the numeration tests was also prepared (ACER, 1976). However there was some concern in 1975 that shortage of time had precluded the seeking of other opinions of the importance and appropriateness of the tasks selected and of the items used.

Two important movements, which were not entirely independent, were evident at the time the present study of community expectations was undertaken in 1976. The movements have lost neither strength nor direction since. First, there was the move to increase local control of education, in terms of school councils or other school or regional governing bodies being given increased administrative and financial responsibility, and in terms of increasing possibilities for school-based curriculum development. In 1976 a report issued by the Victorian Education Department stated that parents have the right to participate in the foundation of school policy (Matheson, 1976:4). This was markedly different from the position in 1974 where senior staff were advised to make themselves freely available for consultations with parents and for suggestions from the community (Matheson, 1976). The continued importance of moves towards the greater involvement of the community in educational decision-making is underlined by the large number of regional and national conferences on the topic and by the Annual Publication of the

79
Australian College of Education in 1977 being devoted to various facets of the relationship between the community and education (Australian College of Education, 1977a).

However not all groups have a common aim in the process of decentralization of educational decision-making. The Australian Teachers' Federation supports moves towards teachers assuming greater control of educational policy in their schools but suggests that parent and community groups be involved in the formulation of educational policy in an advisory capacity [my emphasis]. (Queensland Teachers Journal, 1976). Such an approach has been described by Matheson as tokenism (Matheson, 1976:7). However the Australian Schools Commission Supplementary Grants Program guidelines insist that parent or other community involvement in the formulation of educational program proposals is crucial to the acceptability of the program (Batt, 1978: 10). Differences in aims such as these are a potential source of conflict between teachers and other significant educational and community groups.

Second, there was the accountability movement which is concerned with the relevance and adequacy of schooling, in particular of that part of schooling variously termed literacy and numeracy, the basic skills, the 3 Rs, survival skills, essential learning or the core curriculum. Numerous magazine and newspaper articles, unfortunately some mischievously written in an attempt to sensationalize and misrepresent the situation, are evidence of widespread concern with outcomes of schooling. Naturally enough, there has been some reaction to these articles (in other words the articles have achieved one of their purposes) from teacher groups, education authorities and academics but, in general, the debate has not been helpful in determining what the community does expect of its schools. However one positive reaction was that of the Queensland Chapter of the Australian College of Education which carried out a study, reported by Botsman and Browne, in which community attitudes to a wide range of possible educational outcomes were examined (Australian College of Education, 1977b). The South Australian Chapter of the College has replicated this survey with some minor changes. Generally, in spite of some wrangling, moves towards more local control of education and to accountability for the educational product has meant that a much more diverse group of people are in a position to influence school curriculum and practices than previously when control of education was centralized in the head office of the State Department of Education.

The essential nature of numeracy in any proposed core curriculum has been argued many times (see for example MacDonal, 1977; Bourke and Morgan, 1977; and Bell, 1974). Bell identified 13 areas of mathematics which he argued were important for every person to be able to work with. The areas he identified were:

- * Uses of numbers (including counting and ordering)
- * Use of computation (the four operations)
Relationships (equality, etc)
- * Measurement concepts
- * Approximation and estimation
Links between mathematics and reality
Uses of variables
Correspondences, functions, etc.
- Basic logic
- Probability
- Geometric relations
- * Interpretation of graphs
Computer uses

(Bell, 1974:199)

Those areas marked with an asterisk are the same as, or are very similar to, tasks tested in the ASSP numeracy tests.

A summary of what employers in the Northern Territory said they wanted from mathematics courses for apprentices included simple arithmetic and understanding the four operations (Education Australia, 1977:17-18).

Responses such as this are reported frequently by the media.

More importantly, one of the 45 wide-ranging educational, organizational and social objectives which the Botsman and Browne study asked members of the community to rate for importance was 'Teaching students enough maths to be able to cope with modern living'. This objective was rated first, ahead of 'Insisting on politeness by students' and 'Teaching students to be able to read well enough to read a newspaper' (Australian College of Education, 1977b:57). Thus the overall importance of the socially necessary aspects of numeracy received very strong support.

Purpose of Study

The content of the Numeration Tests used in the ASSP study was made public at the time the results of the study were published. Although there was

considerable support for the content of the tests from within and outside the educational community, two other conflicting reactions to the tests were noted. The more prominent reaction was that the tests consisted of simple but essential items and should have demanded a more exacting numeration performance by students. A less prominent reaction, but one more noticeable from some sections of the educational community, was that students should not be expected to perform the tasks tested until they see a personal need for the performance. According to this latter argument, expressed by some senior educational administrators and by some concerned with mathematics method courses in teacher education programs, the tasks tested and items used should not be considered as essential or even important outcomes of school mathematics programs. As a consequence it was considered necessary to obtain a wider range of views concerning the validity and importance of the content of the tests used in the ASSP project.

The study of community expectations of numeracy reported in this paper was undertaken to ascertain opinions of several significant community groups concerning the importance for everyday living of numeracy as measured by the ASSP project. The degree of agreement that existed between the various groups was of particular interest, especially that between educational and non-educational groups, given the potential for conflict between them. A subsidiary aim of the study was to try a method which involved seeking the views of small numbers of members of selected community groups by means of a questionnaire.

Methodology

The Sample. It will be recalled that the tasks tested and items used in the ASSP study had been selected by an expert panel consisting of teacher educators, research workers and education department personnel. To ascertain other opinions, individuals belonging to the interest groups described below were sampled. The abbreviated name for each group, used in this paper, is also given.

No.	Group	Abbreviated Name
1	Industrial trade union secretaries	Unions
2	ACSPA affiliates	ACSPA
3	Company personnel managers	Managers
4	Secondary school senior mathematics teachers	Teachers
5	Primary school principals	Principals
6	Mathematics method lecturers at CAEs	Lecturers
7	Parents (fathers) of 14-year-old students in 1975	Parents

Table 1 Response to Questionnaire by Each Group

Group	No. of Quest. Sent	No. of Quest. Returned	No. of Usable Returns	% Usable Returns
Unions	30	20	18	60
ACSPA	21	15	14	67
Managers	30	26	24	80
Teachers	30	27	27	90
Principals	30	29	27	90
Lecturers	30	22	22	73
Parents	30	18	18	60
Total	201	157	150	75

The groups selected were intended to represent a range of opinions and interests from a strictly practical concern for numeracy to those more likely to be concerned with mathematical concept development by students. Both educational and non-educational groups were represented. It was thought that members of groups 1, 2, 3 and 7 would tend to be concerned with everyday usage of number and would rate tasks and items emphasising this aspect as more important than others, whereas members of groups 4, 5 and 6 might rate the tasks and items differently and might even rate many of the tasks and items as relatively unimportant as outcomes of schooling.

Thirty persons from each of the seven groups of respondents identified above were selected at random by state where possible. In the case of company personnel managers, industrial trade union secretaries, parents, primary principals and secondary mathematics teachers, the 30 members of each group were selected at random from lists of members, schools or students drawn up by state. With the proviso that at least one member of each group should be selected from each state, the samples selected were weighted by the population in each state. For the CAE lecturers, one was selected from each of 30 colleges where staff membership was known. In the case of the Australian Council for Salaried and Professional Associations (ACSPA), there were only 21 associations, other than teacher organizations, affiliated with the Council and all 21 were approached. It was considered that teachers' views were well represented in two other groups approached in this survey.

Altogether 201 persons were sent a questionnaire and the effective return rates varied from 60 to 90 per cent (75 per cent overall) as can be observed in Table 1 where the numbers and percentages of members who returned usable responses are given. These rates were achieved by means of the original approach and, when necessary, two follow-up letters and one or two phone calls. It will be noted that the response rates for teachers and principals were highest and for unions and parents were lowest. Response rates of 60 per cent were considered to be barely acceptable. The results reported for this study are based on the total of 150 usable returns.

The Questionnaire. The tasks which were assessed by the Numeration Tests at the 10- and 14-year-old levels in the ASSP project were those which were considered to be essential if students were not to be disadvantaged either in further progress through the educational system or in their everyday lives. It was apparent that members of some groups being approached might not be in a position to know which, if any, aspects of numeration were essential for progress through the educational system. Consequently the questionnaire focussed on the question of which tasks and items were important for everyday life in the opinions of the respondents. This limitation needs to be recalled when results are discussed.

Thirteen specific tasks had been tested and each item was related to a task. There were 33 items in both of the Numeration Tests and only eight items were common. Consequently the 58 different items were grouped according to task and respondents were asked whether they considered successful performance of the task or item to be essential, important, of minor importance or unimportant in terms of avoiding disadvantage in everyday life. 'Essential' tasks and items were those judged as an essential element in a test of numeracy which a person must be able to perform if he is not to be seriously disadvantaged in his everyday life. 'Important' tasks and items were those judged to be important, though not essential, in a test of numeracy and which would result in moderate disadvantage in everyday life if a person was unable to perform them. Tasks and items 'Of minor importance' were those judged to be relevant for numeracy but to have a low priority in a test of numeracy because failure to perform the task would result in only slight disadvantage in everyday life. An 'Unimportant' task or item was one which has no relevance for numeracy because it is one which a person does not need to perform in the course of his everyday life.

The 13 tasks which respondents were asked to rate are listed below. For convenience, the tasks have been given shortened names and alphabetic symbols which are also shown.

Task	Shortened Name	Symbol
Counting and ordering	Count	A
Recalling tables	Tables	B
Using the four operations with whole numbers	Numbers 4 ops	C
Using the four operations with fractions	Fractions 4 ops	D
Reading measuring instruments	Measure	E
Reading graphs and tables	Graphs	F
Reading time and calculating with time	Time	G
Calculations involving money	Money	H
Using spatial knowledge	Spatial	I
Estimating	Estimate	J
Using decimals	Decimals	K
Calculating area and volume	Area	L
Interpreting plans and maps	Maps	M

The questionnaire was trialled first with a combined group of 48 Victorian primary and secondary teachers attending an in-service course and, as a consequence, a considerable number of amendments were made. The revised questionnaire was then trialled further with ten industrial trade union secretaries, ten company personnel managers and smaller numbers of teachers and parents before being amended slightly and used to gather the data now reported.

Results

In general, most tasks and items were seen as essential or important by all groups of respondents. For economy the results discussed in this paper are restricted to respondents' opinions of the importance of tasks. When the responses to the questionnaires were analyzed, answers of Essential were rated as 1, Important as 2, Of minor importance as 3; and Unimportant as 4. Consequently low mean results for tasks signify a high rating of importance and high mean results signify a low rating of importance.

The Total Sample. There were three clear clusters of tasks when these were rated for importance by all respondents considered as an undifferentiated group. As can be seen in Figure 1, six tasks were rated as essential (Count, Tables, Numbers 4 ops, Measure, Time and Money) with mean ratings between 1.0 and 1.5, three tasks were rated as important (Fractions 4 ops, Graphs and Decimals) with mean ratings slightly less than 1.9, and four tasks were rated as slightly less than important (Spatial, Estimate, Area and Maps) with mean ratings between 2.1 and 2.3. Thus there was substantial agreement that nine of the thirteen tasks were at least important if students were to avoid disadvantage in their everyday lives. In particular, no respondent rated either Task A or Task B as less than Important, and only two respondents rated Task C in this way, both rating it as Of minor importance. In addition, no respondents rated any of Tasks E, F and H as Unimportant.

Results by Group. Overall differences between the groups were small and for most tasks these differences were less than the differences within groups. The mean ratings for each task by each group are shown in Table 2. The mean ratings for all tasks exhibited virtually no differences between the groups with a range between 1.5 and 1.8 - trade union secretaries giving the highest overall rating of importance and primary school principals giving the lowest.

Differences between groups for each task were investigated by means of a one-way analysis of variance. There was a significant difference between groups for one task only - using the four operations with fractions (the 0.1 level of significance was used). The Scheffe multiple range test (Nie et al, 1975-428) was employed to determine which of the groups exhibited the differences and it was found that the primary principals viewed this task differently from industrial trade union secretaries and company personnel managers. On average, the principals rated operations with fractions between

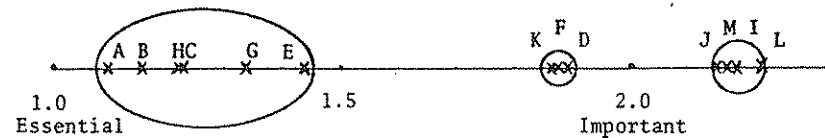


Figure 1 Clusters of Tasks Rated for Importance by all Respondents

Important and Of minor importance while the union secretaries and personnel managers rated these operations between Essential and Important. The other groups, which did not differ from each other, rated the task as Important. The mean ratings and homogeneous clusters of groups for this task are illustrated in Figure 2. Overlapping ovals indicate that differences between mean ratings of groups included in an overlap are not significant.

Although 12 of the 13 tasks did not result in significant differences between groups, there are marked consistencies in the importance accorded to tasks by various groups. When separate tasks are considered, trade union secretaries and personnel managers saw most tasks as more important than other groups. Conversely, primary school principals and mathematics method lecturers saw most tasks as less important than other groups. In addition ACSPA affiliates and personnel managers had somewhat different perspectives on the importance of tasks. In general, the managers rated the mechanical and common arithmetic tasks as more important than other groups (Tasks A, B, C, D, E, F, G and H) while the ACSPA affiliates rated the other tasks as more important (Tasks I, J, K, L and M). However it will be noted that for both of these groups Tasks B and H were rated as more important than the ratings given by other groups. In concluding this brief summary of results, it should be emphasised that, with the exception of the task concerned with using the four operations with fractions, differences between groups were not significant.

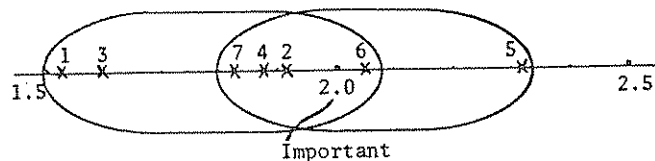


Figure 2 Mean Ratings and Clusters of Groups for Task D (Fractions 4 ops)

Table 2 Mean Rating of Task Importance by Community Group

Task	Community Group							All Groups (Weighted)
	Unions	ACSPA	Managers	Teachers	Principals	Lecturers	Parents	
A Count	1.18	1.15	1.05	1.12	1.09	1.00	1.12	1.10
B Tables	1.13	1.00	1.14	1.15	1.22	1.19	1.18	1.15
C Numbers 4 ops	1.12	1.25	1.25	1.16	1.30	1.33	1.18	1.23
D Fractions 4 ops	1.53	1.92	1.60	1.88	2.32	2.05	1.82	1.89
E Measure	1.38	1.50	1.43	1.39	1.64	1.29	1.50	1.44
F Graphs	1.60	2.00	1.80	1.92	1.21	1.81	1.88	1.88
G Time	1.00	1.39	1.35	1.23	1.43	1.48	1.47	1.34
H Money	1.00	1.15	1.21	1.24	1.25	1.38	1.24	1.22
I Spatial	1.87	2.15	2.50	2.15	2.33	1.95	2.29	2.19
J Estimate	2.07	2.00	2.45	1.96	2.50	1.95	2.12	2.15
K Decimals	1.57	1.62	1.95	1.71	2.24	1.95	1.88	1.87
L Area	2.00	2.15	2.25	2.20	2.43	2.38	2.12	2.23
M Maps	2.00	2.00	2.52	2.15	2.00	2.33	2.06	2.17
All Tasks (Weighted)	1.50	1.65	1.73	1.63	1.76	1.70	1.68	1.68

Conclusion

With respect to the first aim of this study, that is an investigation of the general support for the importance of the tasks tested in the ASSP project, it would seem that the results obtained provided strong support for nine tasks and moderate support for the remaining five tasks. If a rating of the tasks for further progress at school had been included as a criterion of importance in addition to the rating given for everyday living, it could reasonably be expected that support for at least some of the tasks would strengthen. In almost every case differences between community groups on the importance of the very basic numeracy tasks tested were small. Although much more information needs to be collected, particularly on determining the importance of other

34

numeracy tasks and consulting other community groups, the evidence that has been collected clearly suggests that there would be little, if any, conflict between educational and non-educational groups in the community on this issue. An interesting question is how far the agreement would extend beyond the numeracy component of a core curriculum. Piper has used a similar method to determine group views of importance in the social learning area (Piper, 1977). He found a high level of agreement between various community groups, although not as high a level as that reported in this paper for numeracy.

The second aim of the study was concerned with establishing a method which could be used to ascertain the views of representatives of various community groups about specific elements of a school curriculum. It seems that the method was successful as a first step in establishing the importance of tasks pre-selected by an expert panel. Some work has also been done in using this method by having teachers rate the importance of various listening and speaking tasks for schools' language development programs (Bourke and Holzer, 1977). In this case a similar questionnaire was used successfully to supplement data collected in interviews.

It is recommended that the method of rating task importance by questionnaire be used to obtain information on specific tasks associated with other curriculum areas, for example reading and writing, and that the questionnaires be used in conjunction with interviews and discussions. The discussions could take the form of working parties of representatives from various community groups attempting to reach consensus on what should constitute a core curriculum. Perhaps an on-going interest and commitment of this kind by members of various community groups would become the key to ensuring that schools have the opportunity to meet at least the minimal educational demands of the communities which they serve.

References

- Australian College of Education (1977a). The Community and Education. Carlton: The Australian College of Education.
- Australian College of Education (1977b). Community Attitudes to Education in Queensland. Vol.1. The Australian College of Education.
- ACER (1976). Development of the Numeration Tests. Australian Studies in School Performance. Hawthorn: ACER.
- Batt, K.M. (1978). 'The School Proposal and the Concept of Quality.' Paper prepared for Supplementary Grants Program Consultants Seminar, May 1978.
- Bell, M.S. (1974). 'What Does "Everyman" Really Need from School Mathematics?' Mathematics Teacher. March 1974: 196-202.
- Bourke, S.F. and Holzer, F. (1977). Oracy in Schools: Importance, Practice and Assessment. Hawthorn: ACER.
- Bourke, S.F. and Keeves, J.P. (Eds). (1977). The Mastery of Literacy and Numeracy: Final Report. Australian Studies in School Performance Vol.III. Canberra: AGPS.
- Bourke, S.F. and Lewis, R. (1976). Literacy and Numeracy in Australian Schools: Item Report. Australian Studies in School Performance Vol.II. Canberra: AGPS.
- Bourke, S.F. and Morgan, G. (1977). 'The Use of Criterion-Referenced Testing in Curriculum Evaluation.' Paper presented to the AARE Annual Conference. Canberra: AARE.
- Education Australia (1977). 'Bosses Want Return to "3Rs" Teaching.' Education Australia. 1(2):17-18.
- Keeves, J.P. and Bourke, S.F. (1976). Literacy and Numeracy in Australian Schools: First Report. Australian Studies in School Performance Vol.I. Canberra: AGPS.
- MacDonald, T.H. (1977). 'Numeracy - Is it a Basic Right?' Education Australia. 1(2):27-29.
- Matheson, A. (1976). 'Are Teachers Serious about Community Involvement?' Paper prepared for the Conference, Australia 2000: The Ethnic Impact, held at the University of New England, August 1976.
- Nie, N.H. et al. (1975). Statistical Package for the Social Sciences. 2nd Edition. New York: McGraw-Hill.
- Piper, K. (1977). Essential Learning About Society. Hawthorn: ACER.
- Queensland Teachers Journal (1976). 'Community Involvement in Education - Policy Statement of the Australian Teachers Federation.' Queensland Teachers Journal. 81(7).