PRIMARY TEACHERS' PERCEPTIONS OF POLICY FOR CURRICULUM REFORM IN CYPRUS WITH SPECIAL REFERENCE TO MATHEMATICS

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Abstract – *This paper reports and analyses findings from an investigation into Cypriot teachers' perceptions of national policy for curriculum reform in primary schools, with special reference to teaching and assessment in Mathematics. Questionnaires were sent to a 10% sample of Cypriot teachers randomly selected from the total population (n=257). A response rate of 70% was obtained and statistical analysis was carried out by SPSS-X. There were four main findings. First, in respect of curricular purposes, pupils' abilities to resolve investigations and to gain mathematical knowledge were considered to have equal importance while ability to talk about Mathematics was judged to be the least important. Second, formative purposes of assessment were accorded most importance, and summative purposes least importance. Third, teachers approved of active pedagogy. Fourth, they conceptualised assessment as a natural part of teaching but paradoxically favoured formally structured techniques of assessment. Implications for the implementation of curriculum policy are discussed.*

Introduction

The failure of much curriculum innovation has been attributed to the neglect by innovators of teachers' perceptions (Fullan 1991, Nisbet 1973). This has implications for policies of curriculum reform in most industrialised societies. In Cyprus, primary education is under the authority of the Ministry of Education which is responsible for educational policy making, the administration of education and the enforcement of educational laws. Primary schools provide for a six year compulsory schooling for children from 5 to 11. The primary curriculum is prescribed by the Ministry of Education and there is also a statutory time allocation for each subject. In addition, there is a regulation about the minimum and maximum class size. Moreover, children of the same age have to be placed together in the same class. When necessary mixed age grouping is provided. A reform programme common to all primary year groups was introduced in 1992; this reform was mainly concerned content, pedagogy and assessment. A centre-periphery model of change (Schon 1971) was used.

The central government, through inter-departmental committees, drew up syllabuses, curricula, and planning guides, which were distributed to schools. In this context, the purpose of my research was to investigate teachers' perceptions of the reform programme, and to examine the extent to which the perceptions matched the objectives of the reforms. It was decided to take one subject, Mathematics, as an illustration of the reforms, and to investigate teachers' perceptions in detail in this subject. Mathematics was chosen because it is a core subject and relatively culturally free (Phillips 1986). It was therefore possible to compare perceptions of teaching Mathematics held by teachers in different countries.

Methods of data collection and sampling

A randomly selected 10% sample of the whole group of Cypriot primary teachers was surveyed by a questionnaire, so as to establish a representative picture of the perceptions of primary teachers in Cyprus. The content of the questionnaire was derived from analysis of curriculum policy in Cyprus (Ministry of Education 1981, 1992a, 1992b). There were five broad areas of teachers' perceptions:

a) The purposes of teaching Mathematics
b) The purposes which assessment should serve
c) The relative importance attached to different teaching methods
d) Techniques of assessment.
e) Ways of improving assessment

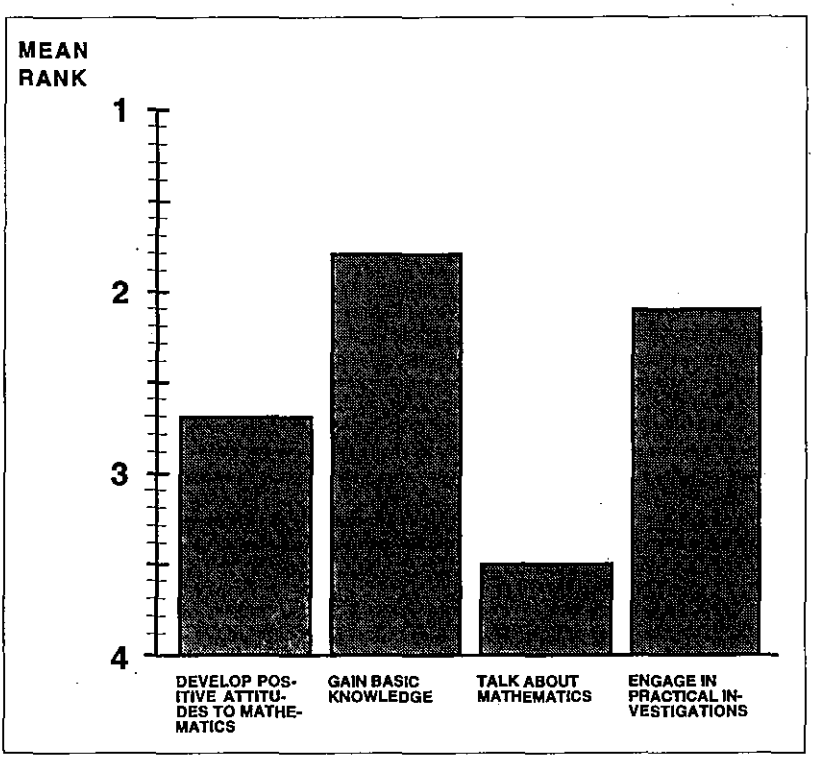
Of the 380 Cypriot teachers approached 286 responded, a response rate of 73%. The response rate implies that the findings do not lack validity for general application to their population (Entwistle and Nisbet 1972). Semi-structured interviews with 20 teachers who responded to the questionnaire were also conducted in order to test the validity of the questionnaire findings by matching the qualitative data derived from interview with each teacher against the quantitative data gathered by his/her individual questionnaire. A measure of match was derived by comparing most of the responses to the questionnaire with the interview data gathered by this study. Although this measure does not necessarily imply that its validity is high since it is possible that they are both invalid, the use of both questionnaire and interview methods provides a basis for triangulation of data.

Findings from the questionnaire

Purposes of teaching Mathematics

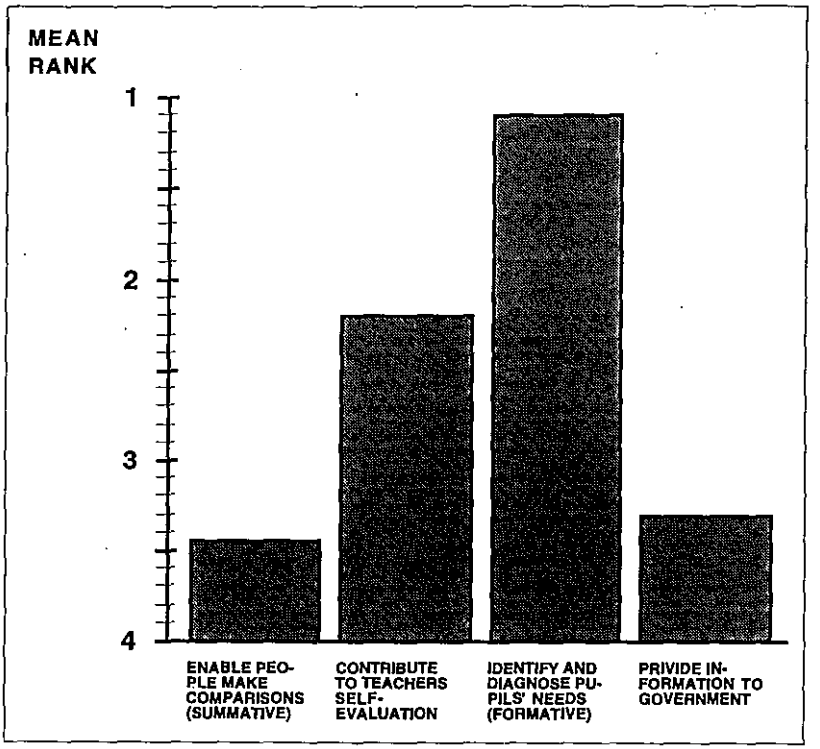
Graph 1 shows the mean rank of the perceived importance of each of four purposes of teaching Mathematics. Kendall's Coefficient of Concordance was calculated to show the degree of consensus about curriculum purposes in this ranking. A significant level of agreement amongst Cypriot teachers was revealed (W1=0.31, Z=2.19 V1=3.99, V2=714, p<.005). Thus, Cypriot teachers gave high priority to purposes concerned with gaining Mathematical knowledge

GRAPH 1: Cypriot teachers' perceptions about the purposes of Mathematics



{Mean Rank (M.R.) = 1.8} and solving investigative tasks (M.R.=2.09). These two purposes were considered of roughly equal importance since their mean ranks are close to each other. The purpose which was ranked as the third most important concerned the development of positive attitudes to Mathematics (M.R.=2.71) whereas the one focused on pupils ability to talk about Mathematics was seen as the least important (M.R.=3.40).

GRAPH 2: Cypriot teachers' perceptions about the purposes of assessment



Purposes of Assessment

Graph 2 deals with perceptions of the purposes of assessment and the statistical procedure used for its creation is similar to Figure 1. Kendall's coefficient of concordance (W2=.74, Z=6.23, V1=3.99, V2 =714, p<.005) shows that teachers agreed among themselves in their ranking of the relative importance of the purposes of assessment. The following observations arise from Figure 2. Formative assessment was considered as the most important by almost all the teachers. The next most important purpose of assessment was the teachers' self-evaluation, which has a mean rank close to 2.00 and 80% of teachers considered it as the second most important purpose. Since teachers' self-evaluation and formative assessment have direct feedback into the teachers' own teaching, it can be inferred that Cypriot teachers considered assessment as a means of providing information to help them make decisions about their teaching. It is also of interest to emphasise the low rating given to summative purposes of assessment and to the use of this for national monitoring. Their mean ranks are close to 3.50 which means that they are clearly differentiated from the other two purposes. As far as the summative purpose is concerned, almost all the teachers (95%) saw it as either the least or the second least important purpose. Similarly, 87% saw national monitoring as the least or the second least important purpose.

Methods of teaching and assessment in Mathematics

The figures in Table 1 are based on the information derived from teachers' response to items of the questionnaire concerned with the implementation of policy on Mathematics pedagogy and assessment. The results are given as percentages of teachers agreeing and disagreeing with ways of teaching and assessment in Mathematics. Medians and modes are also given.

Mathematics Pedagogy

Two observations concerned with perceptions of Mathematics pedagogy arise from Table 1. First, the great majority of Cypriot teachers (more than 65%) agreed with the following aspects of Mathematics pedagogy:

1) Children should talk about Mathematics and present the results of their activities to their classmates
2) Mathematics should be taught mainly through practical investigations
3) Practical activities are appropriate for children irrespective of their age or ability
4) There is a fixed sequence of Mathematical topics for children to follow.

TABLE 1: Percentages of Cypriot teachers who agree and those who disagree with the following methods of teaching and assessment in Mathematics, and their medians, and modes.

No	Methods of teaching and assessment	% Cypriot teachers who Disagree	Agree	Median	Mode
A)	**Mathematics Pedagogy**				
1)	Fixed sequence of topics	14.8	76.0	4.00***	4.00
2)	Practical activities as appropriate for Key Stage 1 pupils (5-8 years old) as for Key stage 2 (9-11)	9.7	77.9	4.00	5.00
3)	Practical activities as appropriate for high attaining pupils as for low	17.9	68.5	4.00	4.00
4)	Needs for talk in each activity	4.4	86.9	4.00	4.00
5)	Fixed time for teaching Mathematics	55.8	20.5	2.00	2.00
6)	Mathematics should be taught mainly through investigations	17.5	65.0	4.00	4.00
B)	**Issues of Assessment Policy**				
1)	Assessment as natural part of teaching	0.5	98.4	5.00	5.00
2)	Assessment on the basis of product rather than process	52.7	25.7	2.00	2.00
3)	Assessment of pupils' attitudes	23.2	54.7	4.00	4.00
4)	Assessment of child's ability to apply Mathematics in unfamiliar situations	10.9	78.3	4.00	4.00

* = This group of teachers either disagree or absolutely disagree

** = This group of teachers either agree or absolutely agree

*** = 1: I absolutely disagree; 2: I disagree; 3: I do not know/I cannot say; 4: I agree; 5: I absolutely agree

Second, the item concerned with the need of having a fixed time for teaching Mathematics was rejected by more than half of Cypriot teachers and both its median and mode is 2.00. Although it could be asserted that the majority of Cypriot teachers disagreed with this item, the fact that the percentage of teachers who neither agreed nor disagreed with it is almost equal to 25% and those who agreed are equal to 20% shows that there was a variation among teachers' opinions. Thus, rejection of a fixed time for teaching Mathematics cannot be seen as a representative opinion of the whole group of Cypriot teachers.

Assessment Policy

The second part of Table 1 is concerned with issues of assessment policy in Mathematics. The great majority (more than 75%) of Cypriot teachers considered assessment as a natural part of teaching and supported assessment of pupils' ability to apply Mathematics in unfamiliar situations. However, items B.2 and B.3 displayed different patterns. Item B.3 was accepted by half of Cypriot teachers but rejected by a quarter of them. On the other hand, Item B.2 was rejected by half of Cypriot teachers but accepted by a quarter of them. Thus, it cannot be claimed that Cypriot teachers, as a group, rejected the idea that assessment should be based on pupils' outcomes rather than process or that they agreed with assessment of pupils' attitudes to Mathematics.

We can observe that for most of the items of Table 1 (7 out of 10) there was a very substantial agreement among Cypriot teachers. Moreover, significant relationships among teachers' perceptions of these seven items were identified by calculating the Pearson correlation coefficient. Thus, teachers' responses to these items are interrelated. On this basis, it can be claimed that Cypriot teachers had a coherent view in support of active pedagogy.

Techniques of Assessment (Appropriateness and Ease)

Teachers were asked to rank twice eight techniques of assessment in Mathematics according to their appropriateness and their ease. The mean ranks and the Kendall Coefficient of Concordance are presented in Table 2. Moreover, columns 4 and 6 show the 'absolute rank' of the mean ranks which is constructed by ordering the mean ranks. (The 'absolute ranks' are used only for display purposes, and their representation does not necessarily imply an ordering of the perceived appropriateness and ease of these eight techniques.) It emerges clearly from the coefficients presented in this table that Cypriot teachers agreed among themselves in their ranking of the relative appropriateness of each technique and

also agreed among themselves in their ranking of the relative ease of each technique. However, the mean ranks tend to cluster close to each other, with small differences between them showing that no one method was regarded as clearly the most or least appropriate or most or least easy.

Nevertheless, the mean ranks suggest that techniques of assessment can be classified into the following groups according to their perceived appropriateness. Structured observation and interview were considered as the most appropriate methods. The oral question-and-answer is the method considered as the next most appropriate. Methods in the middle are the extended written questions, multiple choice questions and direct written questions which have mean ranks very close to 4.5. Finally, unstructured observation was seen as the least appropriate technique and sentence completion as the next least appropriate.

We can now analyse further the features of the third column by exploring the figures at the bottom part of the table. This part has the eight methods collapsed into two categories, namely oral and written techniques. The category of written techniques represents an average of the methods which have to do with a written test and the oral category represents the rest of the techniques. The Kendall Coefficient of Concordance shows a statistically significant agreement among teachers' ranking of the relative appropriateness of these two categories. However, although three of the oral methods were considered as the three most appropriate techniques, unstructured observation was considered as the least appropriate technique. This raises a question about whether the oral category is a coherent one on Cypriot teachers' perceptions. It can be argued that the three oral techniques which were considered as the most appropriate are those which are more formally structured.

The distribution of the mean ranks of ease of application of these techniques is also shown in this table. The first four mean ranks are clearly differentiated from each other. Thus, oral question-and-answer was considered as the most easy technique and unstructured observation as the next most easy. Methods in the middle are the direct written question and the sentence completion. Finally, the mean ranks of interview and extended written question are relatively large and can be considered as the least easy techniques.

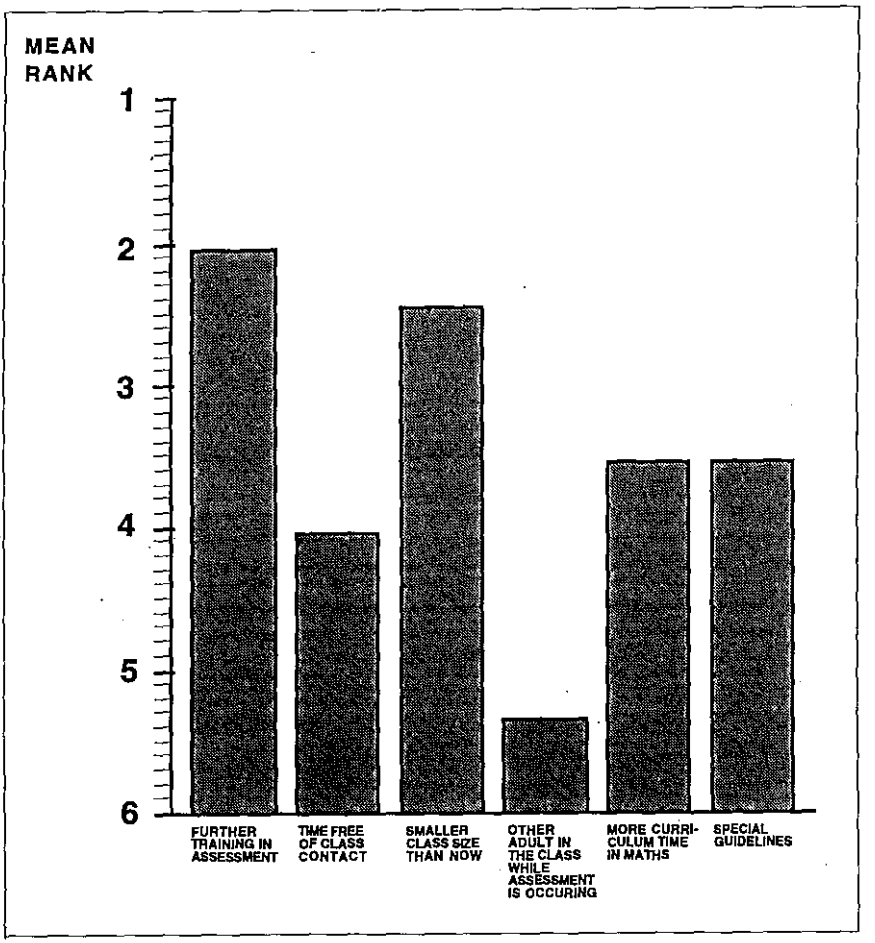
The Kendall Coefficient of Concordance presented at the bottom part of table 2 shows a statistically significant agreement ($p<.05$) among Cypriot teachers' ranking of the relative ease of oral and written techniques. The small value of Z can be explored by looking at the 'absolute ranks' of the 'oral' techniques which were 1, 2, 6, and 8. This seems to suggest that the second category consisted of the most easy and the least easy techniques. Although tentatively we can ignore this significant difference, if we link this finding with that concerning the

TABLE 2: Mean ranks and 'absolute' ranks of assessment techniques according to preceptions of appropriateness and ease

No.	Assessment Techniques	Appropriateness		Ease	
		Mean Rank	Mean Rank	Mean Rank	Mean Rank
1	Multiple choice and matching questions	4.44*	5	5.09**	5
2	Unstructured Observation	6.05	8	3.31	2
3	Sentence Completion	5.34	7	4.22	4
4	Oral question-and-answer	4.01	3	2.38	1
5	Extended written question	4.41	4	5.87	7
6	Structured Observation	3.29	1	5.28	6
7	Interview	3.52	2	5.98	8
8	Direct written question	4.46	6	3.87	3
	Coefficients:	W=0.18 - X2=218.20 df=7 p<.01		W=0.27 - X2=323.19 df=7 p<.01	
	Combinations				
1	Oral ***	1.35	1	1.42	1
2	Written ****	1.65	2	1.59	2
	Coefficients:	W=0.10 - Z=1.353 V_1=0.99 - V_2=174 p<.01		W=0.04 - Z=0.843 V_1=0.99 - V_2=167 p<.05	

* 1 = Most Appropriate 8 = Least Appropriate
** 1 = Most Easy 8 = Least Easy
*** Oral techniques = Combination of techniques 2-4-6-7
**** Written techniques = Combination of techniques 1-3-5-8

GRAPH 3: Cypriot teachers' perceptions about the ways of improving assessment in Mathematics



'absolute ranks' of the appropriateness of 'oral' techniques we can claim that this category was not a coherent one in Cypriot teachers' perceptions.

The last, and probably the most important finding, has to do with the well-known dilemma that what is easily measured is of dubious educational value. Interview and structured observation were considered as the most appropriate but the least easy techniques. Likewise, the direct written question and the unstructured observation were regarded as one of the most easy but least appropriate. However, oral question-and-answer was seen as the third most appropriate and as the most easy method. It can be argued that, with one exception, there is a negative correlation between the appropriateness and ease of techniques of assessment.

Perceptions about ways of improving assessment

Graph 3 provides information about teachers' perceptions of methods of improving assessment. Kendall's coefficient of concordance shows that Cypriot teachers agreed among themselves in their ranking of the relative importance of the six ways of improving assessment ($W=.40$, $Z=2.37$, $V1=4.99$, $V2=888$ and $p<.005$). It emerges from Graph 3 that the most important ways of improving assessment were further training in techniques of assessment and smaller class size, whereas the least important was the existence of another adult in the classroom. The other way which is differentiated from all the other ways of improving assessment is the one concerning time free of class contact which was seen as the second least important way.

Discussion: Implications of teacher's perceptions for curriculum reform policy in Cyprus

The evidence presented above can be discussed in terms of its implications for the implementation of curriculum reform in Cyprus. An exploration of the implications of the findings for curriculum theory will be also attempted.

Purposes of teaching Mathematics

Howson (1989, p.18) believes that "clear objectives are needed but to be effective they must be objectives accepted by teachers", a view that is the basic focus of my research. It is clear from the questionnaire responses that Cypriot teachers' perceptions of the purposes of Mathematics generally conform to the

purposes emphasised in the current curriculum reform in Cyprus. They supported the purposes relating to investigative tasks and promoting mathematical knowledge and thinking identified in both the previous and the New Curriculum (Ministry of Education 1981 and 1992a).

However, the New Curriculum proposed that one purpose was the development of pupils' ability to talk about Mathematics. Doubts about whether this should be seen as a purpose can be raised in so far as the role of language in teaching Mathematics can be seen as a teaching method that may help pupils to see Mathematics as a language (Pimm 1981) and as a part of our culture (Bishop 1989). Nevertheless, a low priority was given by Cypriot teachers to the role of pupils' language in teaching Mathematics which might be explained by the fact that teacher training had not focused upon the role of talk in teaching Mathematics. Moreover, the New Curriculum did not make explicit the implications of this purpose for teaching whereas implications of the other two purposes for teaching methods were provided. To achieve this new purpose both ITT and INSET, in addition to concentrating on the importance of the language in the teaching of Mathematics, should also provide teachers with more specific ways to apply language in classroom settings.

Mathematics pedagogy

Cypriot teachers had a coherent view about active pedagogy, emphasising the value of practical activities, investigative tasks and discussion and their responses to these items showed high inter-correlation. Although teaching methods are not directly subject to government policy, there is an implicit pedagogy in the curricular formulation in Cyprus. This may be characterised as an activity-based approach to the teaching of Mathematics. Thus, both the 1981 and the new curriculum of Cyprus directed teachers to provide opportunities for pupils to participate in practical and investigative tasks (Ministry of Education 1992a). The fact that active learning is supported by the New Curriculum can be attributed to the strong influence of Piaget and the Cockcroft Report upon curriculum policy in Cyprus (Kyriakides 1994).

But despite the fact that a Cypriot teacher concerned to obtain promotion must prove to her inspector that she is able to implement the active pedagogy (Baron 1970), this ideology has not widely influenced curriculum practice of primary Mathematics in Cyprus. Further research is needed to explore this gap between curriculum theory and practice. However, barriers to the implementation of this pedagogy do not lie in teachers' perceptions of teaching Mathematics. The interview data revealed that although Cypriot teachers hold strong ideas favouring

active pedagogy and invest much of their self-identity in it, compromise with beliefs was commonly pragmatic. Cypriot teachers, in recognising the discrepancy between active pedagogy and practical realities, attributed it to the pressure of time arising from an overloaded curriculum. They considered the content of the New Curriculum in Mathematics as difficult for their pupils to understand and the requirements of the curriculum policy as unmanageable. Thus, the overloaded curriculum in Cyprus may be a significant barrier to the implementation of active pedagogy.

It can be also claimed, paradoxically, that barriers to the implementation of policy on curriculum reform in Mathematics may lie in the high degree of central control at school level, through national textbooks, a fixed sequence of topics and a defined length of curriculum time (Shuard 1984) which cause a mismatch between the ideology promoted in curriculum policy and the administration of the system. And although teachers' perceptions about the purposes of Mathematics were similar to the purposes outlined in curriculum policy, the fact that this control did not promote flexible classroom strategies limited the policy's effectiveness.

Assessment policy

Assessment policy in Cyprus is not clearly defined. For the first time in the history of curriculum development in Cyprus, a debate among the officials of the Ministry of Education, the inspectors, the teachers and their trade union was under way in 1990. The dispute was mainly between inspectors and teachers and concerns primarily the extra work involved, and government's requirement to introduce a common form of record keeping. It is therefore important to identify implications of teachers' perceptions for assessment policy in Cyprus.

Cypriot teachers perceived formative purposes of assessment as more important than the summative. This is in line with the argument of Torrance (1986) that "summative assessment is unlikely to prove helpful to teachers who are faced with the day-to-day reality of formative assessment". Broadfoot (1986) argues that the curriculum policies of countries other than the UK promote a move from summative to formative assessment since they have realised the failure of summative assessment. Cypriot teachers would welcome the development of an assessment system which promoted the formative purposes of assessment, but would be less inclined to support one emphasising summative purposes. Thus, the debate may not be restricted to workload but raises fundamental issues of educational ideology. This is particularly true since the Director of Primary Education announced the government's intention to introduce a reporting system where teachers would be required to assess pupils' overall achievement in each

subject at the end of each academic year (Leontiou 1993). This raises doubts about the policy commitment to formative assessment.

Although Cypriot policy documents argued that assessment should be seen as a natural part of teaching, the practical implications of such conception of assessment are not made explicit. This conception may simply reflect the inspectors' acceptance of the objectives model (Kyriakides 1994). However, Cypriot teachers considered assessment as a natural part of teaching. A correlation between their perceptions about methods of assessment and purposes of teaching Mathematics has been also identified. The interview data illustrate implications of this conception of assessment for teaching and specific links between methods of teaching and assessment Mathematics. It can be claimed that Cypriot policy makers should attempt to explore links between purposes, teaching activities and assessment in order to develop an assessment policy based on the consideration of assessment as a natural part of teaching. Thus, analysis of the evidence of teachers' perceptions about assessment implies that the debate about assessment policy in Cyprus should be focused on how it can be linked to the policy on teaching Mathematics in order to provide information to teachers about teaching Mathematics, taking into account their effort to implement the active pedagogy. A coherent assessment and curriculum policy should be developed for teacher development, irrespective of other purposes such as national monitoring. For example, in-service training might be used to focus on problem setting as applied to Mathematics to illustrate the practical form that formative assessment would take.

Two significant implications emerged from the data on Cypriot teachers' perceptions about the appropriateness and ease of the eight techniques of assessment. First, Cypriot teachers considered as more appropriate the techniques which operate under controlled conditions. This might reflect the highly centralised educational system of Cyprus and especially a perceived need to have 'tangible proof' to show to parents and inspectors. With the term tangible proof teachers meant information gathered from assessment which can be easily understood by parents and inspectors since numbers can be used to represent pupils' attainment. However, the appropriateness of the techniques of assessment should be judged on the kind of information they make available to teachers. Thus, inspectors should encourage teachers to use techniques which can help them diagnose pupils' needs irrespective of whether they are under controlled conditions.

However, the Ministry of Education (1992b) intends simply to publish a series of written tests, but not to provide anything related to interview or structured observation which are considered as appropriate techniques by Cypriot teachers. Information derived from written tests do not clearly reveal the mathematical

concept which is involved with a pupil's wrong response (Schwarzenberger 1988). Thus, if assessment policy emphasises only written tests, it would neither find ideological support among teachers nor improve assessment practice, but it would provide the government with another way to control curriculum practice.

Second, there was an inverse relationship between assessment techniques seen as most appropriate and those seen as most easy. Teachers regarded interview and structured observation as the most appropriate techniques but as the least easy. Logically this argues for in-service training on how teachers can use oral techniques for their assessment in Mathematics, as much as it argues for using only written tests. This would be welcomed by Cypriot teachers since training on techniques of assessment was considered as the most important way of improving assessment. It can be also claimed that in-service training should give high priority to structured observation and interview which were seen as the most appropriate but least easy techniques. Thus, INSET focused on the use of interview and structured observation may be a more effective way of improving assessment rather than the publication of more policy documents which are rarely consulted. This provides significant implications for educational policy in Cyprus which has not systematically used INSET to bring about change and has not been directed at the implementation of the current curriculum reform at the school level. The practice therefore goes against the evidence that innovations need both external and local support to succeed (Crandal et al. 1986, Turnbull 1985).

Finally, it can be claimed that this study reveals that a new model of curriculum change that focuses on teachers' perceptions should be developed, since the transformation of curriculum reform into practice depends partly on their perceptions. What is needed is to identify and build upon teachers' perceptions and encourage them to promote curriculum development at the school level and at the same time to welcome support from the centre. As Calderhead (1987) argues:

> *"though research on teachers' thinking does not provide us with a comprehensive theoretical framework for thinking about teaching, it does provide us with a number of insights that have implications for how we approach various educational tasks .... in the case of curriculum development, research points out how unrealistic it is to conceive of innovation as a set of pre-formulated ideas or principles to be implemented by teachers. Innovative ideas are interpreted and reinterpreted by teachers over a period of time and translated into practice" (p.17)*

Thus, research dealing with teachers' perceptions and the factors which are able to influence them will contribute to the development of such a model and the further evaluation of recent curriculum reform in Cyprus.

Notes

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