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# Systemically designed curricula - how do teachers cope ?

ABSTRACT

Educational change has become an increasingly dominant factor in the NSW education system of late. Primary teachers in particular have been inundated with new policies, principles, procedures and curriculum documents over the past five years. Despite this apparent commitment at a systemic level to encouraging educational change, the effectiveness of such projects in producing real change on a large scale has been minimal. This pilot study attempts to investigate how teachers respond to or cope with systemically developed curricula in under-resourced conditions in the implementation phase and why. The vehicle for this study is the NSW Department of Education's "Mathematics K-6" document issued to teachers in November 1989. The study is primarily ethnographic in nature, based on a single school community and incorporating methodological triangulation as a means of substantiating findings. Data gathering methods include questionnaires, interviews and classroom observations.

## Introduction

Primary teachers in New South Wales in particular have been inundated with new policies, principles, procedures and curriculum documents over the past five years. The phenomenal quantity of change initiatives is indicative of the magnitude of change at a state, national and international level in all fields of education.

Curriculum documents in the areas of Mathematics, Visual Arts, Science, English and Personal Development, Health & Physical Education have been distributed to primary teachers since November 1989 together with an expectation that they would be implemented. Additionally, several documents concerning cross-curricula perspectives and policy directions such as Aboriginal Education have been issued to primary teachers with the assumption that they would incorporate the contents into their classroom practices.

Schools Renewal has brought changes of a different nature but no less in magnitude as control of school budgets, staffing and other organisational matters have been devolved from Head Office to regions, clusters and schools.

Despite this apparent commitment at a systemic level to encouraging educational change, only changes of a structural nature, such as those stipulated by Schools Renewal have made any real headway as procedures have been established by governing bodies and no choice has been given to the participants. The effectiveness of curriculum projects in producing any real change on a large scale has been minimal and numerous recent instances of less than effective transformations of teaching and classroom practices hold themselves up to be ridiculed.

Research and writing in the area of educational and specifically curriculum change have become quite prolific over the past decade and point to several main factors that contribute directly to the effectiveness of a particular change initiative. The foremost of these include: teacher involvement in the development of the initiative; teacher perception of relative advantage during implementation; and support (including funding and professional development) for the change at both a Departmental and school level. None of which are apparent to any substantial degree in the innovation examined in this study.

Above all, the literature indicates that the least effective model of curriculum development in terms of ensuring implementation success is the “centre-periphery” or “top-down” model whereby systemically developed innovations are imposed upon schools and teachers with an expectation that implementation will follow as a matter of course. This model and related expectations assume a commitment to the initiative by those who have had no input into its development and success is measured in terms of fidelity of use ie. The extent to which users implement the initiative as intended by its developers.

Notwithstanding the overwhelming consensus that this approach is less than effective it continues to be the predominant model of educational change, particularly in curriculum development in New South Wales, and until revisions are undertaken to truly reflect the findings in the educational change literature, it shall remain as dominant and ineffective as always.

This study attempts to investigate how teachers respond to or cope with imperfectly developed curricula in under-resourced conditions in the implementation phase and why. The vehicle for this study is the “Mathematics K-6” document developed by the New South Wales Department of Education and issued to teachers in November 1989. The methodology employed primarily involves that of a case study incorporating methodological triangulation as a means of substantiating findings. Data gathering methods include questionnaires, interviews and classroom observations.

This paper focuses on factors identified in the literature as contributing to successful curriculum change endeavouring to outline elements of the specific innovation being studied by highlighting context specific examples relating to each factor.

Factors influencing curriculum implementation

Much recent educational research has focused on factors which might influence the implementation level of a given curriculum initiative. Whilst many of these factors are germane to the systemic or localised nature of the innovations studied, there do appear to be a number of factors which, in combination, contribute to the enhancement of implementation levels. After determining which factors most contribute to substantial levels of implementation, the implications for the absence of such factors will be considered.

Michael Fullan (1990a) has become internationally renown for his comprehensive analyses of factors affecting curriculum implementation. His work has been widely cited and as such will form the basis for an examination of potential influencing factors supported where possible by other sources. Cuban (1988), Ornstein & Hunkins (1988) and Donovan (1984) for example, offer slightly different factors yet all of the above demonstrate a great degree of commonality.

In his most recent writings on Educational change, Fullan (1991) describes the factors affecting implementation as interactive and subdivides them into the following three broad categories: A - Characteristics of change, B - Local characteristics and C - External factors. Within each of these categories are subgroups which will now be examined in more detail. The degree to which each is present in this current study will be discussed as examples in order that the contextual variables may be better understood.

Characteristics which enhance curriculum change -

1. Need

This factor relates to the perceived need of an innovation from the point of view of the implementers. Countless innovations have been developed incorporating an expectation of fidelity of use without accurately assessing whether the innovation will meet the needs of the classroom, school and community let alone being a high priority need for those involved in its implementation.

There are many facets to the possible perceived need for the curriculum change indicated in Mathematics K-6. Appropriate to this section, the need for change in mathematics education:- to

improve students' attitudes, understanding and ability to apply mathematics to real world situations has been recognised internationally for a number of decades. Since Sputnik in 1953, the Americans have been endeavouring to introduce a "discovery related" mathematics and science curriculum with very little success. Change efforts in this area have become far more prolific in the last decade however as both Great Britain and The United States of America, amongst many other Western countries, have sincerely attempted to revolutionise their mathematics curricula. The Cockroft Report (1982) and the National Curriculum Teaching and Evaluation Standards (1988) are testament to the magnitude of such initiatives.

Thus it can be said that on an international level, there was sufficient evidence and pressure to warrant a change in mathematics education in New South Wales  if only for the sake of the students. As expected, however, the needs eminating from the classrooms, teachers and schools were not the stimulus for the change - needs were exclusively and external force.

2. Clarity

This focuses on "what" is changing and quite clearly relates to the curriculum materials themselves and the changes communicated within them. Fullan (1991) discusses such difficulties as false clarity  where the changes mooted are over-simplified so as to give a false impression of what is required and consequently changes fundamental to the original innovation may be readily bypassed. Hence, the idea of corruption of an innovation proposed by Burkhardt et al. (1988) can develop into quite a powerful inhibiting factor.

The notion of effectively communicating what is required in innovatory programs is strongly supported by Mitchell & Traill (1986) and Loucks & Zacchei (1983) as a major contributing factor to effective implementation. Hersee (1988) goes further to say that changes in content are much more readily implemented than changes in methodology or practice because of the clarity factor. Content can easily and clearly be communicated in the form of a syllabus, teaching materials or examination questions which has major positive implications for its "take-up" rate.

Mathematics K-6 is an excellent example of a content-dominated curriculum change as noted by Hersee (1988). A major reason for this is the basic structure of the document. Over 86% of the curriculum document is devoted to content - the "what" to teach. Only 7% of the document describes "how" one might teach the content. This belies many of the major changes advocated by the document in terms of teaching practice in mathematics which reflect the international trends as mentioned above. Obviously clarity, or lack of clarity, is a principal difficulty in this

instance as many of the changes in teaching practice are not clearly communicated in the document. There are exceptions to

this such as the use of concrete materials, a focus on the language of mathematics and the use of real life objects and situations, all of which are prominently placed on each of the content pages in addition to appearing in the methodology section. Other changes in practice, such as use of group work and employing a problem solving, investigative focus receive far less attention in the content section and consequently, it would be expected that there would be less evidence of such practices in classrooms.

One final aspect concerning clarity is that there are elements of Mathematics K-6 which I believe illustrate methods completely contradictory to those which the document is actually trying to convey. An example of this is the integration of lessons across the three strands: Space, Measurement and Number. It is clearly stated in the document that mathematics should be taught as an integrated whole yet it's presentation is completely contrary to this as each strand is divided into substrands which are, in turn, subdivided into units. Such a compartmentalised structure in no way supports an integrated approach to teaching mathematics.

3. Complexity

Strongly related to "clarity", this refers to the extent of change required of implementers of the innovation. It has been widely reported that any innovation which involves too large a change in practice will not be adopted yet the counter argument to this is, if the change is so insignificant, why bother ? Hersee (1988) acknowledges that when confronted with an innovation, teachers are likely to translate the changes into familiar terms thus diluting the innovation at the level of implementation. An interchangeable term, "compatibility" , is used by Print (1987) which emphasises that the degree to which an innovation is compatible with current teaching practice directly influences the level of implementation.

The complexity of an innovation would vary dramatically from one individual to another depending on their past teaching practice. In general, Mathematics K-6 demands a far more child-centred, interactive, investigative approach to mathematics than would be evident in the majority of classrooms prior to its release. For some teachers the complexity of the innovation would be immense, moving from a number dominated, textbook and drill oriented approach to that outlined above - for others, the change would be comparatively small.

4. Quality/practicality of program
This area includes the availability and suitability of materials and subsequent ease of implementation. According to Fullan (1991), practical innovations which involve simple "do-it-yourself" activities and allow for "step-by-step" development by the implementers rank highly in terms of implementation levels. Fullan also stresses that quality of change should not be forsaken for practicality nor should changes be trivialised in order that they might be attempted. Rather, more support should be given in order that teachers understand and effectively implement higher quality, more worthwhile changes.

In the case of Mathematics K-6, all teachers in state schools were issued with a copy of the document. In addition, each school was supplied with a set of three resource folders which contained supplementary ideas for classroom activities. While the activities within each of these documents were quite straight forward, there were a couple of immediate problems which surfaced as teachers were expected to implement the initiative. Firstly,

it was so heavily resource dependent. Despite lists of suggestions for low cost resources which could be made or brought from home, almost every activity in the document required concrete materials of some kind. As this was one of the principal focuses of the change being initiated through Mathematics K-6, many schools had few if any resources of this kind so this was a major initial stumbling block. Schools on the Disadvantaged Schools Program (DSP) were able to obtain funds to resource their classrooms more effectively than most and huge DSP programs written to fulfil such needs appeared in great numbers necessitating DSP numeracy consultants in more than one region. Despite this access to funds, there were still not enough resources to equip every classroom with everything and thus the spontaneity intended for resource use was not possible. In non-DSP schools the situation was far worse and many of these schools are still under resourced to this day.

Secondly, the nature of the inservice support was very activity based to the point of demonstrating Fullan's "trivialising" for the sake of simplicity. All of the major programs - BLIPS, TIME, Western Sydney Basics and the subsequent kit generated "Implementing Mathematics K-6" were all activity based workshops designed to involve teachers in the types of activities to be undertaken in their classrooms.

Local characteristics which enhance curriculum implementation
1. District support
Interpreted in the context of the New South Wales Department of

School Education, this equates with regional support, particularly in the area of staff development, for an innovation. One aspect of this is assistance in implementation of mandated curricula. As noted above, systemically developed curriculum documents have a very poor record of implementation for a number of reasons yet continue to dominate curriculum initiatives in this State. Consequently, feelings of frustration, wasted time and a lack of support have become synonymous with educational change. Put simply, not enough funds are allocated to support innovations of this nature. This is strongly supported by Hord & Hall (1987), Hersee (1988), Loucks & Zacchei (1983).

In addition, the entire concept of regional support (particularly of an inservice and financial nature) and its impact on subsequent implementation levels is viewed as by far one of the major determining factors in implementation (Bailey et al. 1991, Skehan 1990 and Fuhrman et al. 1988). Additionally, in his study on agriculture curriculum materials, Pepple (1986) found conclusively that the degree of implementation was directly related to the extent of inservice support. Finally, Fullan (1990b) stresses the absolute importance of staff development to implementation levels by stating that

"the process of implementation is essentially a learning process. Thus when it is linked to specific innovations, staff development and implementation go hand in hand."(Fullan 1990b p 4)

As this is yet another major contributing factor it is interesting to note that there have been significant problems with the inservice and additional support offered to teachers in implementing Mathematics K-6. Firstly, the timing of the support was poor. All of the major inservice programs were run prior to the release of the final document to schools in November 1989. Consultancy support was intense in both 1989 and 1990 but waned immediately afterwards. There was no attempt to improve teachers' fundamental understandings of mathematics and mathematics education as this had not been identified as a need in the initial conception of the innovation. Thirdly, inservice and consultancy support was unevenly distributed, not only across the state but across regions. An example of this was the Western Sydney Basics (mathematics) program which was conducted in 75 primary schools in each of two regions. This was seen to be the most substantial program available to support the implementation of Mathematics K-6 yet only a fraction of schools were involved.

2. Community involvement and support

Again, this factor needs to be considered in the New South Wales context. Largely as a result of Schools Renewal, the role of

parents and community members is becoming increasingly important and influential in the running of NSW government schools. School councils make planning decisions in terms of budgets and expenditure, parent and community representatives sit on staff interview panels and again contribute to the decision making. As this trend continues in the future, this factor will likewise become more significant to the point where decisions about adopting and implementing systemic documents are likely to be greatly influenced by parents and other members of the community. Until this arises however, the concept of a community-driven body rejecting adoption of a mandated curriculum, on whatever grounds, is merely speculative. Stokes (1990) at this stage, however, recommends informing parents of impending changes and enlisting their support where possible as a vehicle to assist levels of implementation.

The community was not consulted in the development of Mathematics K-6 . The perceived need for the innovation from the system's point of view, based on international trends, was far too urgent for consultation with the community. On a positive note, the Implementing Mathematics K-6 document places heavy emphasis on informing parents of the changes involved. In addition, a small booklet Parents Count was published to inform parents of ways that they could assist their children with mathematics at home. This publication had to be purchased by parents, however, it was not available to them at no cost. The approach taken here could be described as informative rather than consultative which it would be in the case of ideal curriculum development. Additionally, the extent to which parents were informed of these changes varied greatly from school to school as involvement of parents, while an expected aspect of implementing Mathematics K-6 was not monitored in any form.

3. The role of the Principal

While acknowledging that the principal strongly influences change at a school level, Fullan (1991) notes that the principal is rarely the main agent for or against change in a school. This is strongly supported by Hord & Huling-Austin (1986) while Gibson et al. (1992) found that teachers, while acknowledging the principal's role, did not attribute major responsibility to principals in curriculum implementation thus lending weight to the notion of an influential though not active role played by principals. This raises the issue of change facilitators, other than the principal, at a school level. This has been one of the major outcomes of the Concerns Based Adoption Model (CBAM) which originated in Texas in the mid 1970's. Hall & Hord (1987) summarise the nexus between active and informed change facilitators and effective implementation at a school level as identified in the CBAM research. According to Miles et al. (1988), not only is a "change agent" essential at the school

level for effective implementation but there are quite extensive skills required by such a person in order to be effective in this capacity.

One of the significant invalid assumptions made by the developers of Mathematics K-6 was that each school would have an individual

capable of performing the role of “change facilitator” or “change agent” and the support of the principal as a change manager. This assumption dominates the major support document issued with the syllabus - “Implementing Mathematics K-6” . Continual reference is made to “committees” and “co-ordinators” which, considering the generalist nature of primary teachers, is likely to be an unreasonable expectation in a large proportion of schools. Mathematics is only one of six main Key Learning Areas that K-6 teachers are expected to teach in NSW. In addition to this, the relatively poor level of mathematics ability and general lack of confidence in teaching mathematics exhibited by mainstream primary school teachers, greatly limits their understanding of the nature of the changes advocated in Mathematics K-6.

This difficulty was addressed in part by the Western Sydney Basics program as two staff (one executive and one classroom teacher) were trained to facilitate the implementation of Mathematics K-6 in their schools. As one of those facilitators, the major difficulties that I witnessed did not involve my school as I had the full support of my executive staff but in schools where this was not the case, there was very little that the teacher-facilitator could do at a school level to enhance implementation of the innovation and consequently the program was minimally effective in those schools.

4. The role of the Teacher

As curriculum implementation is generally recognised as what actually happens at a classroom level, this is one of the most fundamental factors influencing successful implementation of an innovation. The fate of innovations then, whether locally or systemically developed, whether poorly or soundly devised and supported, lies largely with individual teachers. One indication that this factor is considered to be of great importance is that an entire volume (containing nineteen papers) from the 1990 conference Curriculum Directions for the 1990s is titled Teachers: The critical connection in curriculum change.

There are, in fact, many dimensions to the influence of teachers on implementation levels. Perceived relative advantage is a fairly recent notion and is explored by Print (1987). It involves individual’s perceptions of how implementing a particular innovation will be advantageous. In the main, these advantages

are related to teaching practice (ease of use and preparation time for example) but they do also incorporate elements of student benefit. Teachers' psychological states are also a major contributing factor and have been examined extensively by McKibbin & Joyce (1980) and Poole & O'Keafor (1989) who have found relationships between levels of implementation and teachers' attitudes and self-efficacy.

Involvement in curriculum development and subsequent "ownership" of the initiative has been widely identified as a critical factor. This element is completely disregarded in systemic curriculum development and the related "fidelity of use" syndrome. As a result, one of the major reasons for the downfall of centrally developed curricula initiatives is the almost complete dearth of perceived teacher involvement in their design. Numerous studies have pointed to both the positive effects of teacher involvement (Goldman & O'Shea 1990, Price 1988, Wilson 1988 and Shanker 1986), and the reciprocal negative impact in its absence (Waugh & Godfrey 1992, Bailey, et al. 1991 and Farrell & Collins 1990).

Teachers' response to the change initiative has also been nominated as a contributing factor. For example, Hitch (1990) notes that many teachers see no reason for change as it is just

another example of the pendulum swinging to an extreme, a pendulum that will once again come to rest in the centre and in fact, attempts made over the past two decades support this notion almost to a fault.

Fullan (1991) points out that in addition to the impact of the individual, there is an extensive peer influence which governs the acceptance and subsequent implementation of an innovation. This is supported by Poole & O'Keafor (1989) who found that more frequent task interactions between peers often resulted in higher levels of implementation. In addition Mumme & Weissglass (1989) espouse the benefits discussing innovations and sharing ideas with colleagues and the power of resultant learning that ensues from such interactions.

As evidenced by the examples above, teacher involvement was by far the most dominant throughout the literature. As one might expect with a centrally developed innovation, there was minimal teacher involvement in the development of Mathematics K-6 . That is not to say that there was no involvement at all, in fact the majority of the activities were written by classroom teachers, but only a "preferred few" who displayed the appropriate level of expertise to belong to a select committee. Trialing, too was done in classrooms yet this was another selective procedure - the

average teacher in the average classroom, who would be expected to implement the end product, had little to no involvement.

The second element to be considered is the perceived need for change from the point of view of the teachers. One of the major difficulties here is the generalist nature of the primary teacher as outlined earlier. In considering these circumstances it is evident that the perceived need for change would be greatly diminished from the teachers' point of view.

In addition, primary teachers in NSW have been inundated with changes at all levels over the past five years or so - from Schools Renewal which has devolved almost all decision making and budgeting powers to regional, cluster and school levels to the release of five major K-6 curriculum documents and several policy and support documents since late 1989 - the average teacher has been forced to cope with phenomenal degrees of change in every facet of school life. The impact of such far reaching changes on teachers' psychological states and their view of "perceived relative advantage" becomes solely teacher-focused so that the answers to questions such as "Will it save time ?" determine whether or not an innovation is likely to be adopted. As in the case of Mathematics K-6, when the answer is indisputably "No", the chances of effective implementation are greatly reduced.

External factors

1. Government & other agencies

This factor is very closely linked with that of the school district although it is one step further from the site of implementation - the classroom. As the government and related agencies are usually the source of systemic curricula, Fullan (1991) identifies a preoccupation with the initiation of innovations and a minimal focus on implementation. In general, this level of the system is responsible for designing and disseminating innovations. The stage following this is largely fraught with minimal support and poor communication. In the few instances where these difficulties have been overcome, Fullan sees the hope for future improvements.

In the case of New South Wales, Mathematics K-6 was developed under the realm of the Department of Education. As a Departmental document, its mandatory implementation status was initially

confined to government schools and schools within the Independent Schools system or the Catholic Education system were not obligated to implement the document. Subsequent curriculum initiatives have been developed by the Board of Studies which is now essentially responsible for curriculum development across the entire state. Since its inception in 1990, the Board of Studies

has sanctioned the Mathematics K-6 document which means it's use is now mandatory in all schools throughout New South Wales. Unfortunately, simply mandating that a document must be used in all classrooms does not ensure that any level of implementation will occur at all and as in the case of most systemic curriculum initiatives, far more support from the government agencies concerned is required in order to facilitate any reasonable levels of imlementation.

Summary

As can be seen from the discussion above, very few of the factors which are said to enhance implementation of an innovation are present to any great degree in the case of Mathematics K-6 , the vehicle for this study. This has major implications for the evidence of implementation that may be gathered in the form of data in the course of this research project. The absence of such factors to such an large extent would suggest that there will be extensive evidence of teachers using coping strategies to assist them in the implementation of an innovation developed and resourced in such a manner.

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