Visions of Curriculum Change

***Norma C Presmeg**, professor vid Florida State University, arbetar med ett forskningsprojekt kopplat till lärarfortbildning i samband med de läroplansförändringar som pågår i USA. Hon diskuterar här vad det är som krävs för att ge de nya perpektiv på matematikundervisning som gör att man når det önskade målet med förändringarna.*

In Sweden, as in the U.S.A. and many other countries, far-reaching changes in school mathematics curricula are under way. A curriculum, in mathematics as in any other subject, is not something which can be picked up and put down, like a pen. It lives in the hearts and minds of its practitioners, the curriculum developers, textbook writers, educational administrators, and above all the teachers who breathe the life into it.

When a curriculum changes, as it must because society is not static, teachers are called upon to change too. And it is not just a question of adopting a new list of topics to teach – a new syllabus. The process is far more complex and demanding than that. Embedded in the various stages of development, and also in the implementation of a new curriculum, the heart of the process is finding new visions of what mathematics teaching and learning could be, *need* to be, in today's world.

That is what this article is about. It is about visions of change caught initially by curriculum developers, but especially, it is about teachers in mathematics classrooms, and *their* visions.

According to Howson, Keitel and Kilpatrick (1982), there are four components which belong to a mathematics curriculum, namely, aims and objectives – including the philosophy which underlies the curriculum – content, methods, and evaluation procedures. When a new curriculum is introduced, to a greater or lesser extent the changes which are made affect all these areas. If the changes are seen only as content adjustments, then the implementation of the new curriculum is not likely to be successful.

But what is involved in the deep-seated changes which take place in teachers' thinking and classroom practices as they prepare to implement a new mathematics curriculum in their classrooms? In a curriculum change project initiated at The Florida State University, involving mathematics and science teachers at elementary, middle and high schools (Tobin, 1992), three necessary components were identified (Shaw and Jakubowski, 1991). These components of successful curriculum implementation are as follows.

1. Perturbation and reflection

Teachers themselves need to perceive a need for changes in the curriculum. This perception involves reflectiveness on the part of teachers, and may come about as a result of perturbation – as an individual teacher becomes perturbed by something in his or her environment as it concerns mathematics education. The idea that change is preceded by mental discomfort is not new. This state of mental discomfort has been referred to as disequilibration (Piaget and Inhelder, 1962). It is likely that increased use of imagery follows what Kaufmann (1979) called "cognitive conflict". Mental pictures of various kinds seem to help us make sense when we are perturbed about something (Presmeg, 1985).

2. Vision

It is necessary for teachers to have alternative visions of what classroom learning of mathematics might be like. These images need to be clear and strong enough to provide alternative pictures which are in line with the envisaged new curriculum. Yet each new vision is individual, constructed by each unique teacher for his or her individual situation and students. It is necessary, then, to overcome the isolation of each teacher in his or her classroom: this may be accomplished by groups of teachers collaborating in schools, viewing each others' lessons, attending in-service workshops and working closely with university or project personnel in implementing the new curriculum.

3. Commitment

The final component is commitment to this vision of learning. Even when a teacher is committed to the implementation of a new curriculum with its built-in goals, aims and objectives, the existing culture of the school may be such that change is difficult. Once again, unified teamwork facilitates change, and school support may aid individual teachers in their commitment. This support may take the form of a school providing an extra replacement teacher who can free successive teachers from their classrooms in order to watch each other's lessons, collaborate and support each other in the effort to develop fresh visions, and thereby to change classroom practice.

When I started teaching, the curriculum changes of the decade of the 1960s were in their early stages. As a former high school mathematics teacher, I believe that an ethical question is raised in the whole area of teacher change. To what extent can, or should, "experts" expect to change the educational beliefs and classroom practices of individual teachers? After all, teaching is a very individual and personal vocation – a science, but also an art – and individual teachers are the experts on the subject of what works for them, in their unique classrooms and situations. Curriculum developers need to recognize the expertise of teachers. It is only as teachers perceive the need for change, develop their own visions of what such change might entail, and commit themselves to implementing their new visions in their unique classrooms, that curriculum change can occur at a deep-seated level. The changes of the 1960s arguably did not succeed partly because it was not recognized that individual teachers needed to develop these three components. Of course in this complex process of curriculum change, there were other factors as well. But what stands out for me is the role of teachers' images of classrooms in this regard.

One final point that I would like to make is that teachers' visions of their classrooms are often metaphoric. An image of a classroom is not a metaphor according to Weade and Ernst (1990), since the essence of a metaphor is the connection of one domain of experience with another. But the vision of teaching and learning which a teacher holds is inevitably in line with his or her metaphors (for example, 'the classroom is a workplace', 'a teacher is a mother hen', 'teaching is acting', etc.). As teachers become aware of their implicit metaphors through reflection, they empower themselves to try out new metaphors and develop new visions of their classrooms and practices

My research will be investigating the role of changing images related to metaphors of pre-service teachers at Florida State University in Fall, 1992. The visions of individual teachers appear to be an important component of curriculum change.

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Nytt forskningsprojekt

I samverkan mellan Tekniska Högskolan i Stockholm (KTH) och Högskolan i Jönköping har ett nytt forskningsprojekt startat med namnet *Matematik, yrkeskunnande och teknologi, MYT-projektet*. Initiativtagare och vetenskaplig ledare är Bo Göranzon, professor i yrkeskunnande och teknologi vid KTH. Forskningsprogrammet kommer att genomföras av Jan Unenge (projektledare) och Anita Sandahl.

Bo Göranzon har i sin forskning, redovisad t ex i avhandlingen Det praktiska intellektet (Carlssons Förlag), visat på vissa faror vid datorisering av delar av en yrkesverksamhet. En fara är ett försämrat yrkeskunnande genom att vissa färdigheter inte längre tränas. En annan är att datoriseringen leder till ett regelföljande och det kan vara svårt att tolka de resultat som datorn visar eftersom dessa kan vara detaljresultat, svåra att bedöma rimligheten av. Feltolkningar av resultat kan i yrkeslivet få svåra ekonomiska konsekvenser.

Paralleller kan dras till vad som händer när vuxna börjar använda miniräknare och anser sig förlora färdigheter i t ex huvudräkning, detta i motsats till barn som ”växer upp” med datorer och miniräknare.

Datorprogram och utnyttjande av miniräknare bygger på att man försökt beskriva delar av en yrkeskunskap med hjälp av matematiska modeller och det är i grunden bristande kunskaper i matematik eller ”fel” kunskaper i matematik – som är ett viktigt skäl till svårigheter när användaren skall tolka (del)resultat. Projektets huvuduppgift är att söka kartlägga dessa brister och visa vilka matematikkunskaper som är nödvändiga i en allt mer ”datoriserad och teknifierad yrkesvärld”. Ett resultat från projektet kan vara att konkretisera vilka matematikkunskaper som krävs och för att eleverna skall *med förtrogenhet och omdöme utnyttja miniräknarens och datorns möjligheter*, som det heter i förslaget till ny kursplan.

Med projektet förverkligas en idé som Bo Göranzon framförde i en paneldebatt redan vid Matematikbiennalen 1986 (se Nämnaren nr 4, 85/86)