In mathematics education, the theory-practice-problem and its changes have been intensively discussed over the last 20 years and up until today (Bazzini 1994; Even & Loewenberg Ball 2003; Seeger & Steinbring 1992; Verstappen 1988). As any educational discipline, mathematics education is located in the tension between scientific research and constructive developmental work. This is connected to the general claim that, mathematics education research and developmental work creates and supports positive influences and changes for teaching and learning processes in school (and university).

In the frame of the theory-practice-problem, this complementary task of research and constructive development brings mathematics education up against the following fundamental question: “What is the special nature of the relation between theory and practice?” The long, traditional opinion, that knowledge and subject content are carefully researched and elaborated in didactical theory in order to be then handed on to school practice, has been increasingly criticized and superseded by other views. This perspective has been replaced by the idea that (school) practice and (didactical) science have to be seen as two relatively autonomous institutions and areas of work, between which there are no possibilities of direct influence or change (cf. Bartolini-Bussi & Bazzini 2003; Krainer 2003; Steinbring 1994; 1998). Each of these two areas is subject to its own expectations and goals, as well as system-based challenges and norms, which cannot be simply overcome from the outside, in an attempt to influence and purposefully regulate the other area in any direct way.

The relative separation and respective autonomy of (educational) theory and (school) practice, however, does not mean that there are no reciprocal actions whatsoever between the two. In the relation between theory and practice, one area can rather be seen as a necessary environment to the other, in which irritations and stimulations appear, indirectly inspiring the respective area to launch changes, alternative
ways of proceeding and further developments. Attention must be paid to the fact that positive changes in (school) practice – but also in educational theory – ultimately have to develop from the inside and from "within themselves" and to grow stronger; impulses from the outside are helpful and necessary, but they are not deterministic steering instruments.

Educational research and constructive development work, in the context of education as well as continuation training, take place in a complex, networked structure of many participating persons (students (Sts), teachers (Ts), teacher students (Tsts), researchers (Rs), teacher educators (TEs)) and institutions (classroom, schools, universities, continuation schools, ...) (see Figure 1).

This diagram illustrates the interconnected system between the different participating persons and between "theory" and "practice". Exemplarily, for each connection, one central form of cooperative professional activity is given without claiming for completeness as other forms exist. This is a networked structure; it is not at all hierarchically structured in the sense that deductively secured results and strict inputs from "theory" can be delivered to "practice". All contributory institutional areas together with their participants–students and classroom, teacher and school, researcher and university, teacher student and university, ... – have to be understood as independent, autonomous communities which communicate with each other and can also cooperate, but which at the same time are subject to their respective conditions, expectations and goals and thus fundamentally differ from each other.

This view, of a complex, networked, institutional and person-related structure of mathematics teacher education and research, requires a

![Diagram](image)

Fig. 1. The inter-related network of research and collaboration in mathematics teacher education