

Cambridge Journal of Education

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/ccje20>

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Published online: 22 Jul 2013.



To cite this article: Franz Rauch (2013) Regional networks in education: a case study of an Austrian project, Cambridge Journal of Education, 43:3, 313-324, DOI: [10.1080/0305764X.2013.818102](https://doi.org/10.1080/0305764X.2013.818102)

To link to this article: <http://dx.doi.org/10.1080/0305764X.2013.818102>

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Regional networks in education: a case study of an Austrian project

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(Received 13 September 2012; final version received 28 February 2013)

This case study presents the development of networks in education, using the Austrian IMST (Innovations Make Schools Top) project as illustration. The regional networks are coordinated in every Austrian federal province by groups made up of teachers, representatives of the educational authorities, and members of academia. In the framework of the IMST project, all networks are monitored by a team of the Institute of Instructional and School Development at the University of Klagenfurt. This article presents theoretical concepts, network structures and network activities, as well as evaluation data. The overall challenge in trying to enable sustainable development of learning of those involved might be described as keeping momentum between network structures and network processes or, in other words, between stability and flow.

Keywords: educational networks; partnerships in education; science education; case study; systems intervention

Theoretical background of the IMST networks

In the early 1980s, the notion of ‘networks’ became very popular within society as a whole and the scientific community in particular. Naisbitt (1984) talked about a ‘megatrend’ of transformation within and of hierarchies, arguing that informal networks of small groups become necessary in order to optimize organizational processes of problem-solving which can no longer be performed by hierarchical structures.

According to Castells’ (2000) notion, networks constitute a new social morphology in society, where dominant functions and processes are increasingly organized around networks. New information technologies provide the material basis for its pervasive expansion throughout the entire social structure. Castells (2000) conceptualizes his notion of ‘network’ as a highly dynamic, open system consisting of nodes and flows.

In the wake of these general social trends and structural transformation, networks in educational contexts have also become increasingly attractive in educational systems. In the 1990s, systemic school modernization processes were launched by policymakers, prompted by the need for reformatory change in the light of the results of international assessment [like the TIMSS (Trends in Mathematics and Science

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Study) and PISA (Programme for International Student Assessment) studies]. Having proclaimed 'school autonomy', the central administration in Austria has been more and more focusing on contextual steering activities whilst delegating responsibilities to decentralized units (Fullan, 2007; Posch & Altrichter, 1993; Rauch & Scherz, 2009). Less bureaucratic steering generates a need for alternative coordination (Altrichter, 2010). Intermediate structures (Dedernig, 2007; Czerwanski, Hameyer, & Rolff, 2002) such as networks are expected and conceived to fill a structural gap and take over functions traditionally assigned to the hierarchy. Ideally, networks are conceived as an interface and an effective means of pooling competencies and resources (OECD, 2003; Posch, 1995). As intermediate structures, they manage autonomy and interdependent structures and processes, and try to explore new paths in learning and cooperation between individuals and institutions.

The development of the IMST networks was based on international work in the field of educational networks and social networking theories. In this process, authors consider the following aspects paramount:

- *Mutual intention and goals*: Networks orientate themselves on a framework topic and goal horizon that has been agreed upon by all (Lieberman & Wood, 2003).
- *Trust orientation*: Mutual trust is a prerequisite for exchanging and sharing knowledge, and therefore a prerequisite for learning. Networks encourage new, innovative paths (risk-taking) and support conflict resolution (McDonald & Klein, 2003; McLaughlin, Black-Hawkins, McIntyre, & Townsend, 2008).
- *Voluntary participation*: Networks do not impose sanctions. Interventions can be vetoed (Boos, Exner, & Heitger, 2000; McLaughlin, Black-Hawkins, McIntyre, & Townsend, 2008).
- *Principle of exchange (win-win relationship)*: Information can be exchanged whenever an occasion arises. Mutual give and take is vital. Power and competition, while not being excluded, are addressed and dealt with between the centre and the periphery on the same level (McCormick, Fox, Carmichael, & Procter, 2011; OECD, 2003).
- *Steering platform*: Networks are not occasional interactions, but institutionalized configurations. Networks have to be coordinated and maintained in order to support exchange processes, cooperation and learning (Dobischat, Düsseldorf, Nuissl, & Stuhldreier, 2006).
- *Synergy*: Networks enable synergies through structural organization; they offer an alternative to classic rationalization strategies and are characterized by the dismantling of structures (Schäffter, 2006).
- *Learning*: Networks are support systems based on reciprocity. Those involved can exchange views and information, and cooperate on mutual concerns. They learn from and with each other (Czerwanski, Hameyer, & Rolff, 2002; O'Hair & Veugelers, 2005).

Per Dalin's (1999) description of how networks function in education is an important theoretical basis underlying the formation of regional networks in IMST.

Accordingly, networks have an *informative function* which becomes visible in a direct exchange of practice and knowledge for teaching and school, and as a bridge between practice and knowledge.

Through networking, further opportunities for learning and competence development (professionalization) are encouraged by the members, who establish the *learning function*. Trust is a prerequisite for cooperation within a network. It is the basis for the *psychological function* of a network which encourages and strengthens individuals. In a fourth function of networks, *the political function*, enforceability of educational concerns increases, following the motto ‘together we achieve more’.

The IMST project

The following section gives an overview of the nation-wide IMST project and focuses on the sub-programme ‘Regional Networks’.

The IMST project aims at improving instruction in mathematics, science, IT, German language (the latter targeted at literacy) and related subjects. The focus is on student and teacher learning (www.imst.ac.at).

Since 1998, the Institute of Instructional and School Development at the Alpen-Adria-Universität Klagenfurt has been repeatedly commissioned by the Austrian Federal Ministry of Education, Science and Culture to carry out the project. It developed in three phases: (1) analysis of Austria’s disappointing results in the 1995 TIMSS; (2) the development and research project IMST (2000–2004); and (3) the build-up of a support system for schools (2004 ongoing). In the first and second phases, the project was targeted only at secondary higher schools. Since then, it has been opened to the entire educational system (K–12 and teacher education). In Austria compulsory schooling starts at the age of six and lasts for nine years. The first differentiation of the school system is after four years at the beginning of lower secondary level. Pupils have a choice between two types of school that last for four years each: these are the lower secondary school and the lower cycle of secondary academic school (AHS). Then they can decide between a vocational (VET) and a general education pathway. VET programmes are provided within the framework of apprenticeship training (dual system), at VET schools and VET colleges. General education is imparted at the upper cycle of AHS (http://www.bic.at/downloads/en/brftipps/0_1_bildungssystem_en.pdf).

The project currently involves some 21,000 teachers who participate in projects, attend conferences, or cooperate in regional and thematic networks.

The IMST ‘Regional and Thematic Networks’ programme supports regional networks in all nine Austrian provinces, and three thematic networks which operate at national level. Within the IMST thematic programmes, teachers put innovative instructional projects into practice and receive support in terms of content, organization and finance. Furthermore, 18 Regional Educational Competence Centres (RECC) in science subjects were implemented all over Austria as a cooperative structure between universities and teacher education colleges. To some extent, they fill the gap of the lack of subject didactic centres in higher education throughout Austria and provide research-based didactic professional development for teachers. Gender sensitivity and gender mainstreaming are key project principles; their implementation is supported by the Gender Network. Evaluation and research are integrated at all levels to assess the impact of IMST.

The following three goals are pursued in the medium term by the establishment of the networks:

- Raising the attractiveness and quality of lessons and school development in mathematics (M), biology and ecology (BIU), chemistry (CH), physics (PH), information technology (INF), geography (GWK), descriptive geometry (DG) and related subjects, as well as cross-curricular initiatives in secondary academic, vocational and secondary general schools, as well as primary schools (since 2007). The results and content of the IMST project create a framework for guidance for the instructional and school initiatives in the network.
- Professional development for teachers.
- Involvement of as many schools as possible (widespread effect).

The regional networks were formed according to the following two principles:

- Use of existing personnel, institutional and material resources in the federal provinces.
- The persons and organizations involved take responsibility for the development of regional networks in each of the federal provinces.

The idea underlying IMST allows a steering committee in each regional network to coordinate and be responsible for the creation of content. In these steering committees, the subjects of mathematics, science, IT, and the province education board (including since autumn 2007 teacher training colleges) are represented.

To emphasize the fact that the regional networks are sustainably embedded in the federal provinces, IMST support is linked to each of the federal provinces, and resources (teaching hours, funds) are made available.

The detailed task profile of a regional network is geared to the needs of the schools in the region and to existing resources. It always includes the establishment of a platform for schools and teachers, arranging opportunities for sharing experiences and further education, supporting the creation of concentrations and their development in schools, developing a pool of experts to advise on didactic and school matters, drafting an annual report and interim reports on the activities of the regional and thematic networks, as well as evaluation.

The networks are aided by financial support, a platform for ongoing process management, two seminars per year for the network steering committee members, public relations (leaflet, IMST newsletter), accompanying research and studies on the development of networks through the network team at the Institute of Instructional and School Development.

Based on the above theories and on the framework guidelines, the following section will present the experience of the regional network in Styria.

The regional network in the federal province of Styria

In 2003, the network in the federal province of Styria was the first of nine networks to form. After several preliminary discussions between the Styrian school superintendents for secondary academic schools, leaders of working groups for the subjects of biology and ecology, chemistry, mathematics and physics, and representatives of IMST, the cornerstones for the foundation of regional networks were in place. The IMST project pledged grants and guidance; the province education board guaranteed administrative support and compensation for the members of the steering committee.

A steering committee emerges

After several meetings, an initial steering committee composed of six members (teachers of the subjects BIU, CH, PH, M) supported by a province school superintendent and the regional network team in the IMST project was agreed upon. Major goals in the first year included the development of a network structure to link as many contacts as possible, functioning as a communication hub, attaining maximum awareness and support from teacher initiatives with a minimum of red tape, and effectively disseminating 'good practice' examples. Substantively, network building was and remains aimed at improved science lessons through communication and networking in diverse activities. One concern was to provide cross-curricular activities and new learning opportunities for open-minded secondary academic and secondary general school teachers. A way in which all subjects and types of schools could be embedded in the structure of the network had to be found. Since a steering committee is hardly able to act effectively with 20 or more members, it was decided to limit the group to 10 members and to create substructures instead. Between 2003 and 2009, the steering committee was enlarged to include representatives from the subjects of geography and economics, descriptive geometry, IT and languages, as well as by two representatives from compulsory education. In addition to the steering group, which covers the entire coordination of the regional network, cross-curricular subgroups for different school types dealing with didactics and with school development were initiated. The first subject groups to emerge were those for chemistry/physics, followed by biology, mathematics and geography. They offered an opportunity to actively collaborate to all interested colleagues. In addition, one teacher from each of these subject groups is also a member of the steering committee.

A successful launch

The regional network was officially launched in February 2004, with a one-day kick-off event in Graz, to which secondary academic and new secondary school teachers were invited. In addition to guest lecturers from the IMST project and business circles, 18 schools presented posters of their projects, four of which were selected for a detailed presentation in the plenary. The ways in which regional networks offer assistance – in this phase particularly as a contact and coordination centre – were introduced. One hundred and thirty teachers seized this opportunity to gather inspiration for project lessons or school development and to exchange experiences. This meeting was a successful first step in introducing and publicizing the Styrian network. Feedback shows that a mix of specialized lectures, the possibility to learn about field projects and the opportunity to discuss topics with peers were key factors in creating a successful event.

Network activities

An annual leaflet is published and distributed to all secondary academic, vocational and secondary general schools, and as of 2007/2008, to primary schools as a means of communication. It features basic information about the Styrian network, what it can offer, as well as the addresses of all steering committee members who are available as contacts for enquiries.

The network pursues the strategy of passing on the better part of the funds granted by IMST to the teachers in the form of school projects. Financing the material required for the project (to the tune of several hundred euros) by reimbursing teachers upon submission of receipts was viewed as a non-bureaucratic form of support of school projects. Examples of sponsored projects range from classroom activities to school projects involving several grades, to a modelling competition in descriptive geometry, which has since established itself nationally throughout Austria. More than 100 projects at Styrian schools have been supported by the network since 2005. The projects are presented at the annual networking day. Some 700 teachers took part in the past five 'networking days' either actively, or as visitors, and some 80 projects (partly financed by IMST or the regional network) were presented either with posters or in the plenary. In this way, the Styrian regional network hopes to disseminate 'good practice'. Moreover, dedicated teachers are offered a forum for the presentation and exchange of ideas.

In addition, the network organises and carries out Inservice Education and Training (INSET) activities for different types of schools and interdisciplinary topics, for example, joint INSET events for physics teachers of all school types or interdisciplinary seminars on different environmental topics. Being rather uncommon until recently, this peer-driven form of further education is appreciated in particular by teachers at secondary lower level.

Pub science is a project that was created spontaneously in 2006. Members of the steering committee and other interested physics and chemistry teachers presented experiments in the informal setting of a pub. The goal was to kindle interest in sciences and to make them more approachable. The first event of this kind was held in June 2006, and attended by more than 120 guests. Thanks to the positive echo of 'pub science', the event was repeated several times at different venues. Ever since, numerous such events have been staged and turned out to be great fun for all those involved.

Panel debates with representatives from the University of Graz and the Technical University of Graz, from universities of applied sciences, teacher training colleges and other external places of learning are another regional network activity. These afternoon panels have met with great interest and would like to reach out to a larger number of schools and teachers. By electronically forwarding the universities' offerings throughout the network and by including the contact addresses in the annual network folder, the Styrian regional network acts as an information hub. The contacts such established are the basis for smooth cooperation between universities, teacher training colleges and the regional education board in the foundation of a RECC in Styria. In the process of creating a national centre (Austrian Educational Competence Centre – AECC) for the subjects of biology, chemistry, mathematics and physics at university level, a regional centre for physics was created, rooted in the regional network. In autumn 2006, this centre was established in cooperation with the Styrian regional network, the University of Graz, the Styrian education board and the two teacher training colleges in Graz. In 2007/2008, a regional centre for geography, chemistry and mathematics was founded. In the meantime, centres for biology and IT have been established as well.

Formation of district networks in compulsory education

Since the academic year 2006/2007, three district networks have been set up, with the aim of concentrating and harnessing willingness for active cooperation at secondary general schools, and – ever since their inclusion in IMST – also at primary schools. District networks offer a high potential for encouraging instructional and school development. In the district of Weiz, 40 teachers from four secondary general schools and five primary schools work together on the project ‘Via Math – All Paths Lead to Rome’. The goal is to change the teaching and learning culture in mathematics lessons. The main focus is on verbal comprehension and on the development of a constructivist teaching and learning culture. This didactic initiative is aided by a further education course (organised by the network) and systematic accompanying research. In addition to indicators which suggest that the didactic measures had a concrete impact, the first results show (Peer, 2008; Schwetz, 2008) that the following aspects contributed to the success of the district network – a trusting atmosphere in the teacher groups and support from school leaders and superintendents through professional planning and design of the meetings, as well as the accompanying research. Thereby, the expectations of teachers as to the benefits of what was being offered were met to a high degree. After the first year, a steering committee of primary and secondary general school teachers developed, which aims at further developing and continuing work on the project idea of changing the teaching and learning culture in mathematics lessons (Müller, 2008).

With this, the first step in incorporating primary and secondary general schools into the network was successfully completed. The interest of primary schools and kindergartens in taking part in IMST is very high. There is a noticeable increase in the number of primary school teachers who work in the subgroups. The Styrian regional network and IMST are attempting to support the promising developments of the district networks.

Problems encountered

Not all goals set by the network have been achieved to the satisfaction of those responsible. One example is the creation of a website which prompted lengthy discussions as to its meaningfulness in a time of information overload.

In the beginning, existing websites for the subjects of biology, chemistry and mathematics were used. Moreover, an attempt was made to create a forum on the existing IMST website so as to make information on activities, seminars and projects available. The information, as well as project reports and guidance for fund applications was available through the Styrian regional network on a mutual platform for all Styrian secondary academic school working groups. The response was minimal, which seemed to confirm the scepticism regarding the effectiveness of the proposed website and led to the relocation on to the IMST site for regional networks.

A further problem is the improvement and coordination of cooperation between schools and business establishments, as there are several individual initiatives in different fields. This will be a focus of future work, as industry interest in cooperation with the educational system is growing, driven by the need to counteract the sizeable lack of young professionals, particularly in technical fields, which is making itself felt today already. Contacts with the Chamber of Commerce and the

Federation of Austrian Industries have been established. One of the last annual network conferences was hosted by the Chamber of Commerce. Recently cooperation with the local paper industry has started and has led to a regional conference for teachers and support of projects at schools.

The involvement of vocational schools has been less dynamic. Interaction is made more difficult, as sciences are often sidelined at commercial schools and colleges for occupations in management and service industries. There is, however, a successful model in Upper Austria in which a dedicated and charismatic headmaster, acting as a 'driving force', founded his own network for vocational schools (Rauch & Scherz, 2009).

Evaluation

Evaluation is an essential part of the IMST project. The regional networks are assessed by self-evaluation and external evaluation. The individual regional and thematic networks submit written documentation, including an evaluation, in line with the cooperation agreement. As of May 2012, 65 reports have been submitted by regional networks.

The regional network leadership team documents process guidance it has provided in a log book and gathers written and oral feedback on the network seminars.

In 2006, a series of interviews was commissioned. In each of the six current regional networks (Carinthia, Upper Austria, Salzburg, Styria, Tirol and Vienna), semi-structured guideline interviews on the experiences and evaluations were held with the representatives of the steering committee, as well as with teachers in schools working with the IMST regional networks (Erlacher, 2006). In the same year, the Ministry of Education commissioned an online questionnaire for province superintendents and school leaders (Heffeter, 2006), and an expert group evaluation in 2007 (Prenzl, Schratz, & Messner, 2007). In 2009, two in-depth interview-based case studies were conducted in the Styria and Salzburg regional networks (Erlacher, 2009; Strametz, 2009).

Selected evaluation results in all networks

According to an online survey, a high percentage of the respondent province superintendents (73%) were aware of IMST activities in the sciences (Heffeter, 2006). According to the respondents, the focus of IMST networks lies in cooperation, exchange of information among teachers, facilitating the professionalization of teaching staff, and in strengthening and developing didactics. With its innovative concept, the IMST process 'has broken the rutted pattern of thought and practice of pigeonholing in the Austrian school system' (Heffeter, 2006, 47). Issues relating to the link between gender and learning in science are looked at by IMST. A third of those questioned view the 'encouragement of girls and young women in science and technology as a central idea' of IMST (Heffeter, 2006, p. 22).

According to the online survey respondents, the wide-reaching effect of the relatively young network is judged as 'astonishingly large', backed by the work of the province superintendents, who are for the most part involved in the networks. Alongside school leaders, they are vital nodes in the transmission of information. For superintendents, allocating teaching hours to steering committee members is an additional task. Since 2003, approximately 10% of all Austrian teachers have taken

part in network events. (This is only an approximate figure, as the number of individuals taking part in multiple events has not been recorded.) Until now, the network attracted the strongest appeal from teachers at secondary academic and secondary general schools. In vocational and in primary schools, both regional network and IMST are in their early stages, with a strong dynamic development in primary school education (see information on district networking).

In five further federal provinces, similar steering committees have been formed based on the Styrian networking model. In three federal provinces, small core groups of two to three people (network coordination) and an extended steering committee (between eight and 20 members), which generally meet eight times a year for consultation, were developed. The significance of the steering committees in the current developmental phase is viewed as particularly meaningful by the members themselves, as well as by non-involved teachers. They are viewed as a 'central element' for maintaining network 'continuity' (Erlacher, 2006, p. 47). The steering committee cannot be allowed to mutate into the hierarchal centre of the network, nor to a network within a network. If this were to happen, sight of the basic idea, i.e. the mutual exchange of ideas and collective learning, might be lost.

One may conclude from the regional network reports that the majority of networks, based on what is offered, are geared to the interests of teachers whose needs were not met until now by the further education support provided by the federal provinces attempting to create attractive offers. One example is further education events on cross-curricular topics for teachers of several school types, as well as on current topics such as standards development, PISA tests and testing culture. The network in Tyrol is embarking on another route in which the steering committee (in conjunction with schools and individual, central teaching staff) suggests a special topic in which the schools may choose to take part (i.e. meteorology, nanotechnology, alternative energies). In Salzburg, the first phase included concrete initial projects (e.g. the installation of a planet learning trail) which were designed to get teachers interested as quickly as possible and had a widespread effect. Further spotlights are to shed light on the activities of other networks. Alongside a wealth of other activities, the main activity in Upper Austria is the bi-annual 'Experimentale' – a didactic event with high media coverage and strong teacher and student involvement. The Carinthian regional network organizes annual 'Science Days' featuring lectures and workshops with scientists and experts. The Viennese network offers, among other things, successful course-like seminars on, for example, laboratory instruction or biodiversity, and publishes a network newsletter for schools covering the regional network activities. In cooperation with the teacher training college, the Lower Austrian regional network offers a comprehensive range of further education seminars. The regional network of Vorarlberg focuses, *inter alia*, on the theme of energy. In the province of Burgenland, the network is currently still in its formation phase and mainly concerned with organizational and structural networking.

Additionally, the interview studies (Erlacher, 2006, 2009; Strametz, 2009) and the other reports suggest that collaborative networking encourages cooperation, allows for diverse contacts, and strengthens interdisciplinary cooperation. On a personal level, participation in networking is viewed as a contribution to further personal development and to strengthening self-confidence (Erlacher, 2006).

Members of the steering committees take part in a bi-annual nation-wide meeting of the regional networks in Austria. There, open questions and new developments from IMST are discussed and the regional networks' individual experiences are shared. These meetings are viewed as an important tool to support network development (Rauch & Scherz, 2009; Rauch, Kreiz & Zehetmeier, 2007).

Summary

How can the development and evaluation processes be summarized? What can be learned? Social contacts are indispensable for the creation of structures and the transmission of information. Therefore, the strategy of using and developing existing regional structures was successful. Such developments, however, can only happen in small steps. Support from the province education boards is quintessential for the continued development of regional identities in networks. The duties of the steering committee and its coordinator(s) are diverse and can only be accomplished by teamwork.

Good practice cannot be cloned, but exchanging experiences on a personal level might foster learning and innovation. Networks in education offer goal-oriented exchange processes among teachers (*information function*) which support the professional development of teachers (i.e. fresh ideas for classroom teaching, interdisciplinary cooperation at schools) (*learning function*). Therefore networks have the potential to create a culture of trust, with the effect of raising self-esteem and risk-taking of teachers (*psychological function*) and upgrading science at school (*political function*). In the long run, a balance of *action and reflection* (goal-directed planning and evaluation) and *autonomy and networking* (analysis of one's own situation, but also support by 'critical friends', i.e. colleagues at school, IMST facilitator) is paramount in order to set up a sustainable support system for schools. Evaluation and research need to be driven by an interactive link between an interest to gain new knowledge and a developmental interest. A culture of self-critical and collective reflection might flourish, but reflection should not hamper a project from being taken forward.

The regional networks carry out creative projects and thereby try to raise the attractiveness of science lessons in cross-curricular cooperations which involve several school types and use innovative methods. Networks are seen as a complementary strategy for disseminating innovations and reform. On their own, however, networks are hardly in a position to bring about system change (McDonald & Klein, 2003). The question arises how they should develop to be able to support reform. In this context, the highly dynamic development of regional didactic centres (since 2007) is noteworthy. These centres developed within the network structure. They provide a place for didactic further education, development and research in the region. By their design, they are to act as a cooperation structure between universities (responsible for the education of teachers at secondary academic schools with a tradition in science) and teacher training colleges (responsible for the education of compulsory school teachers and for further education with a tradition in practical experience), and generate impetus for the design of education programmes. In the coming years, the focus will be on constructively creating collaboration between networks and didactic centres, as well as on quality development and assurance through process management, process guidance, evaluation and research.

The overall challenge might be described as keeping momentum between structures and processes or, in other words, between stability and flow to enable sustainable development of learning.

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