

THE COOPERATION OF SCIENCE TEACHERS: SOME RELEVANT ISSUES

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Nowadays a large discussion is open on the teaching/learning quality issue. It is clear that *“learning is a process of construction in which the students themselves have to be the primary actors”* (von Glasersfeld, 1995). By nowadays the view of the learner has changed from that of a passive recipient of knowledge to that of an active constructor of knowledge. It must be taken into account that *“learning is a process of knowledge construction, not of knowledge recording or absorption”* and *“learning is knowledge-dependent; people use current knowledge to construct new knowledge”* (Anthony, 1996). Having in mind this it is important to promote the active cooperation of science teachers in teaching process.

Collaboration and cooperation (*there are some important differences between these two terms and we prefer to use the second one*) of science teachers are very important components of process of teaching and learning. It is a first step to the constructive, integrated process of teaching. Without adequate cooperation it is not possible to reach the appropriate level of integration, except for internal integration of teaching subjects at a lesson. But in that case a degree of integration is not high enough. Cooperation of science teachers is possibly at all stages of educational process. For example, such cooperation is very effective by preparation of joint teaching/learning programs (curriculum) and concrete plans of activity. Cooperation depends on many factors, for example, the psychological microclimate in collective, motivation of teachers to work better, motivations of pupils and their interest to natural sciences in general. We need teachers to go beyond traditional school science with its emphasis on “key” concepts (Eisenhart, Finkel, & Marion, 1996) and focus also on the processes of learning and thinking about learning (Watters, James, Ginns, Ian, 2000).

Some schools are completely not ready to cooperation and science teachers mostly work individually, not aspiring to find new opportunities. It is obvious that many natural science teacher education programs prepare teachers to teach a particular science subject. From this point of view usually it is difficult for teachers to be involved in fruitful cooperation process in order to improve quality of teaching. Science teachers' cooperation with primary school teachers also is very important factor for improving of science teaching and learning process. It is effective step for preparation of young students for further learning in secondary school level. The teachers of natural sciences of basic school frequently emphasize that the junior schoolchildren obtain insufficient primary natural science education. Primary school is evidently an essential link of the whole system of general education, and therefore acquired propaedeutic natural science education is weighty (Lamanuskas, 2003). In this case the promotion of cooperative teaching and learning is obviously relevant. All science teachers must agree that:

- it is possible to integrate the knowledge acquired by studying separate subjects (biology, chemistry and physics);
- students can be led into a situation of using their knowledge of different natural sciences simultaneously;
- all external resources need to be found outside the school and involved in common

activities (for example, non-governmental organizations, public institutions, libraries, universities, museums etc.).

For effective science teachers collaboration is important:

- to coordinate different programs for all school year;
- to define the basic concepts and terms for each science subject (chemistry, physics, biology, geography etc.), to agree about the general/common interpretation of these terms at different lessons;
- to define the basic contacts/relations of all science subjects;
- to organize different intersubject actions during formal and informal education;
- to involve researchers from different science centres into common activity with students etc.

Nowadays an important way is “Discovery learning”. In this case cooperation of science teachers at school is as guarantor of efficacy of teaching/learning process. “Discovery Learning” requires that the teaching process should be divided into 4 steps (Xu, 2001):

- a) design a proper situation according to the content of the course and then explain the problem to be solved in the situation;
- b) the students provide possible solutions or hypotheses through various activities;
- c) the possible solutions are tested through theories and practice;
- d) discover new theories (or new knowledge).

Cooperation among teachers, administrators, a research institute and in-service activities allowed the development of materials which reflect the students’ relationship with nature, promote responsible action, and are sensitive to the cultural aspects of the topic (Riquarts, Henning Hansen, 1998). Educational researchers (Ball, Runquist, 1993; Weinstein et al., 1991) have documented the central and critical role of cooperation in helping teachers understand new conceptions of teaching and in developing innovative classroom practices. Also an important point is that cooperation reduces the isolation of teaching (Brickhouse, Schifter, 1991). One way to overcome this isolation and its pernicious effects is to create cooperative opportunities for professional development and learning during which teachers can obtain information, discuss ideas, classroom experiences and techniques, critique each other’s practices and support each other’s efforts (Hunsaker, Johnson, 1992). The effective forms of cooperation are (Blumenfeld, Krajcik, Marx, Soloway, 1994):

- a) work sessions and conversations via telecommunications;
- b) structured interviews that probed ideas about teaching and learning;
- c) case reports;
- d) school visits.

Modern ICT allows new forms of cooperation over time and place, bridging differences and breaking down spatial and temporal barriers. ICT allows teachers in diverse settings to cooperate. It is accepted that ICT makes the process of teaching/learning more effective and beneficial whereas the education system starts functioning faster. The development of ICT and the process of globalization determine alteration in the education system as well as in the whole society. The implementation of new technologies in the educational process raises new possibilities for both teacher and learner, enhances education quality and makes the educational process more versatile (Lamanauskas, 2009).

Teachers need to plan what the program or service will look like (e.g., a peer tutoring program, a co-teaching service, a weekly team meeting), but they also need to prepare for the requirement of working together (Gable, Friend, Laycock, & Hendrickson, 1990).

Finally, I want to point out that cooperation (collaboration) among science teachers undoubtedly raises efficiency of teaching/learning process. It is a first step to the constructive, integrated process of science teaching. Without adequate cooperation it is not possible to reach the appropriate level of integration, except for internal integration of teaching subjects at a lesson. Teachers’ cooperation (collaboration) in schools breaks the isolation of the classrooms. Cooperation is an important vehicle through which teachers can plan and carry out an array of services for students. One of the most promising benefits of teachers’ cooperation is the increased

opportunity it gives teachers to interact with one another regarding different teaching and learning issues. Specifically, teachers who cooperate are more likely to discuss with their colleagues areas of the curriculum they have difficulty teaching. The some more statements on cooperation among science teachers can be mentioned: cooperation has a direct impact on students; cooperation is becoming an essential ingredient in successful schools; cooperation is based on belief in the value of shared decision making, trust, and respect among participants; teachers cooperate only when they share a goal; teachers must make a personal choice to work cooperatively; cooperation is voluntary, not administratively mandated; each teacher participating in a cooperative effort contributes some type of resource; cooperation can only occur when it is associated with some program or activity that is based on the shared goals of the individuals involved etc. Cooperation with colleagues is helpful way for improvement of professional knowledge of science teachers. So, the need for cooperation is evident in the science education arena in both formal and non-formal situations.

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