

Survey on Teachers Attitude towards Science Teaching

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Abstract

The Center for Science Education and Training – CSET at the National Institute for Laser, Plasma and Radiation Physics was involved in the last six years in several projects focused on the use of modern methods, mainly inquiry-based, in science and mathematics teaching at pre-school, primary and middle school level: Fibonacci, Discover, Chercheur en herbe, Creative Little Scientists, Instem, Sustain. Inspired by these projects, we decided to look further into teachers' attitudes on science education and to design a survey. Our intention was to have a more profound understanding of what teachers are thinking about their capabilities to improve science teaching at pre-university level and the way their participation to various projects could influence their practice in science classes. We run this survey by the end of May – beginning of June 2014, in the context of the national project "Inquiry-Based Education in Science and Technology: i-BEST" CSET coordinates in Romania. The invitation for participation was done either directly, or through counties school inspectorates and teachers training centers (Casa Corpului Didactic). In the first two weeks from the call launch, more than 330 teachers enrolled in this activity. The study targeted several aspects related to teachers perception in relation to: the means of science teaching, the resources they use to prepare science lessons, the way participation to educational projects assist them in their continuous professional development, the major obstacles they encounter in implementing science classes, the best approaches to be employed in disseminating projects best practice, their opinion on the use of inquiry-based strategies in science teaching. The paper summarizes our endeavor to clarify some aspects related to Romanian teachers' attitudes in relation to science teaching and their involvement in educational projects.

1. Introduction

In teachers education environments there is a consensus that the term "attitude" is equivalent to "point of view", "bias", "predilection", "prejudice", "prepossession" [1]. In some academic works, "attitudes" and "believes" are used as interchangeable terms, while other research studies operate a distinction between the two terms [2,3]. In some educational psychology approaches "believes" include "attitudes" along with "values, judgments, axioms, opinions, ideology, perceptions, conceptions, conceptual systems, preconceptions, dispositions, implicit theories, explicit theories, personal theories, internal mental processes, action strategies, rules of practice, practical principles, perspectives, repertoires of understanding, and social strategy" [4]. Nevertheless, teachers' believes and attitudes relative to the teaching and learning process are one of the pillars and drivers of their activity in the classroom, having a major impact on the educational demarche outcomes. Teachers' "practical knowledge" (content knowledge, concepts, believes, and values) reflect their classroom experience over many years, and their attitudes and approaches in science teaching are sometimes difficult to be changed [5]. Previous research identified several factors which can assist or obstruct science teaching, mainly in relation to inquiry-based learning, such as [6]: (i) time factor, referring to "the length of a class period, semester or school year"; (ii) resources factor, pointing to "laboratory equipment, materials or online access" supporting classroom activities; (iii) professional development factor, dealing with teachers training to improve their practice and rise their confidence. Based on these arguments, we decided to evaluate Romanian teachers' attitudes on science teaching in relation to the factors listed above and to their experience from educational projects they previously participated to.

2. Research approach and methodology

Our intention was to have a more profound understanding of what teachers are thinking about their capabilities to improve science teaching at pre-university level and the way their participation to various projects could mark their practice in science classes. We run this survey, by the end of May – beginning of June 2014, in the context of the national project "Inquiry-Based Education in Science and Technology: i-BEST" (<http://education.inflpr.ro/ro/IBEST.htm>) CSET coordinates in Romania.

2.1 Research questions

As the study targeted several aspects related to teachers perception in relation to: the means of science teaching, the resources they use to prepare science lessons, the way participation to educational projects assist them in their continuous professional development, the major obstacles they encounter in implementing science classes, the best approaches to be employed in disseminating projects best practice, their opinion on the use of inquiry-based strategies in science teaching, the present paper addresses the following questions:

1. *What are the main means you acquire information on new methods of science teaching?* This question was of multiple choice type, and respondents had to select one or several answers: (i) professional development courses (PDC); (ii) participation to seminars and conferences; (iii) professional publications; (iv) debates on fora; (v) visit of dedicated Internet sites; (vi) discussion with colleagues and peers; (vii) professional meetings of teachers; (viii) others, please specify.
2. *How often do you use the following resources to prepare science classes?* The question is of rating scale Likert type (possible selections: never; not so often; often, very often) and offered a selection of answers: (i) manuals; (ii) training aids you developed yourself; (iii) Internet resources; (iv) audio or video resources; (v) library resources; (vi) equipments and materials designed for experiments; (vii) ICT means (PC, laptop, tablet) and specific educational software (virtual experiments, games); (viii) digital equipments (interactive board); (ix) resources from media (newspapers, journals, magazines).
3. *In your opinion, what are the major obstacles limiting efficient science teaching?* This multiple choice question provided the following possible answers: (i) inappropriate science curriculum; (ii) lack of time to run science classes; (iii) the great number of school students in the class; (iv) lack of documentary resources; (v) lack of materials and equipments for experiments in the classroom; (vi) lack of teachers science related competences; (vii) the present methods for students assessment;
4. *By what means, teachers' involvement in educational projects assists them in their professional development?* This was also a multiple choice questions, with the possible answers: (i) courses/ workshops/ demo sessions; (ii) access to teaching resources; (iii) development of partnerships; (iv) exchange visits; (v) meeting with experts; (vi) virtual collaborative networks; (vii) exchange of best practice; (viii) can you suggest any other means you consider to be of interest.
5. *According to your opinion, what are the most efficient means to disseminate at large scale the projects results?* This was a multiple choice question with the choice to select from the listed answers: (i) projects reports; (ii) demo sessions; (iii) symposia; (iv) professional publications (in print or virtual); (v) Internet site; (vi) seminars and workshops; (vii) leaflets and DVDs; (viii) media (TV, newspapers); (ix) the school magazine; (x) teachers' fora; (xi) professional meetings; (xii) others, please specify.

2.2 Participants to the study

The invitation to participate to the survey was addressed to over 600 Romanian educators, they are kindergarten educators or pre-school teachers, primary teachers and middle and high school science teachers, who took part in the past, in a way or another, to previous educational projects coordinated by CSET. In the first two weeks from the call launched, more than 334 teachers enrolled in this activity and 250 of them answered all questions.

2.3 Method of data collection

Data were collected through the "Monkey survey" platform. In the preamble of the survey participants were informed on the scope of the study and were instructed on the way to proceed with the survey. Data provided by the participants are used only for research and statistical purposes, the Institute being registered to the National Supervisory Authority for Personal Data Processing under No. 15407.

3. Data analysis and research Findings

Fig. 1 illustrates the answers to the first research question "*What are the main means you acquire information on new methods of science teaching?*". The respondents can select from a set of multiple answers. Most of the teachers (90 %) are very comfortable with the professional development courses, which are very popular, their number being quite high as most of them are organized nowadays under the Structural Funds umbrella, at no charge. The visits of dedicated Internet sites are also widespread among Romanian teachers (74.2 %). On the third place, with a percentage of 57.1 % are placed conferences and seminars, while professional journals account for 63.4 %. 44.4 % of the Romanian teachers relay for help on meetings and 55.9 % on discussions with peers. On-line communities (i.e. discussion forum) are not so used by the participants. Under the "other" entry we

can find: individual study; media resources; educational projects; educational research; Master degree or PhD studies.

Teachers attitude towards the resources they are using in science classes are given on Fig. 2 (question “*How often do you use the following resources to prepare science classes?*”). The results indicate that the resources “often” used by teachers are: Internet sites (57 %); training aids developed by teachers themselves (194 answers); video and audio resources (173); manuals (153); ICT (147); library resources (142), and equipment/ materials for experiments (137). On the other side, very few teachers base their science classes very often on: written resources (37 answers) or materials distributed through media (37). 147 of the respondents never access digital educational aids. It is surprising that only 115 of the participants consider manuals as their resource of choice.

The opinions of the respondents to the third question “*In your opinion, what are the major obstacles limiting efficient science teaching?*” are summarized in Fig. 3. 76.7 % of the participants consider the lack of adequate equipments and instrumentation for classroom or laboratory experiments is the major limitation in science teaching. About 77.4 % agree that the curriculum has to be changed for a more efficient science education, at all pre-university levels. Too many students in the class constitute an obstacle in their activity. It is the opinion of 52.8 % of the teachers. 44.4 % of them are complaining that there is not enough time during the class to run science lessons appropriately. Surprisingly, only 28.1 % of the educational staff is aware that there is a need of more efficient means for students’ assessment in order to improve science teaching.

The role of teachers’ participation to educational projects in respect to their professional development is highlighted by the answers to the fourth question (Fig. 4) “*By what means, teachers’ involvement in educational projects assists them in their professional development?*” Most of the teachers (34.3 %) regard their involvement in educational projects as an opportunity to take part to courses, workshops and seminars. This participation constitutes also an occasion for them to exchange good practice (28.5 %). 13.1 % of the answers indicate an interest towards involvement in virtual collaborations. A very low importance is paid to exchange visits (3.6 %), development of partnerships (5.5 %), and meeting with experts (7.7 %).

The respondents provided a variety of additional answers to those suggested by the survey such as: (i) demo sessions; (ii) development of laboratories dedicated to science teaching; (iii) team building; (iv) preparation of some educational guides; (v) short visits abroad with students; (vi) an educational platform to assist teachers in their science lessons. Some teachers underline in their responses that nowadays training courses are more formalized and their benefit is quite small by attending these activities. Another interesting comment provides a reasonable explanation concerning the popularity of courses and workshops, as they are run in the frame of some projects: they are offered for free.

The last question “*According to your opinion, what are the most efficient means to disseminate at large scale projects results?*” offers some insides on teachers vision regarding the modalities of projects results dissemination. The question goal was to assist us in understanding teachers’ strategies in promoting projects outputs and planning the projects’ impact on their community. The collected answers indicate that Internet is perceived as the most efficient way to promote a project results (23.3 %). Demo sessions (8.7 %), professional publications (11.3 %), media (9.1 %), and seminars / workshops (14.9 %) are other teachers’ choices for dissemination. Projects beneficiaries do not appreciate too much the possibilities to spread the word about their results through their own school publications (1.5 %) or by projects’ reports (1.5 %). Other dissemination means include: (i) extended fora, with students participation; (ii) model activities organized at local or national level; (iii) exhibitions; (iv) exchange visits; (v) printed materials to be distributes directly to interested groups.

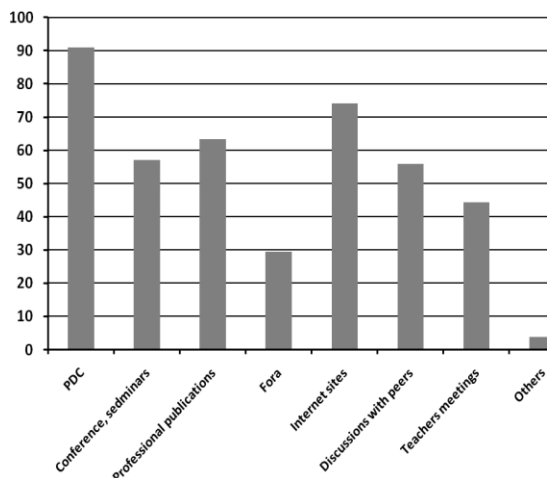


Fig. 1. The participants' responses to the first research question (in percentage).

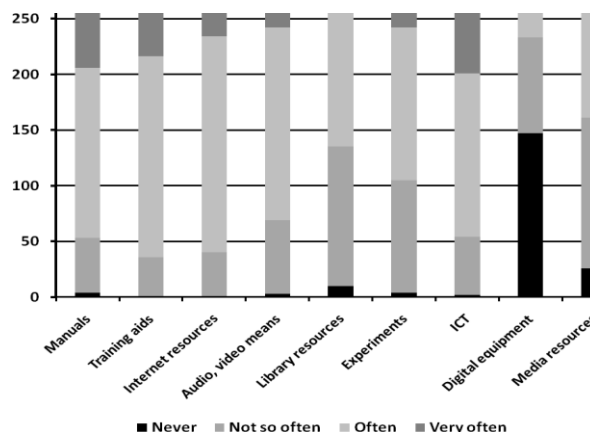


Fig. 2. The most used resources in science classes, expressed as number of respondents using them.

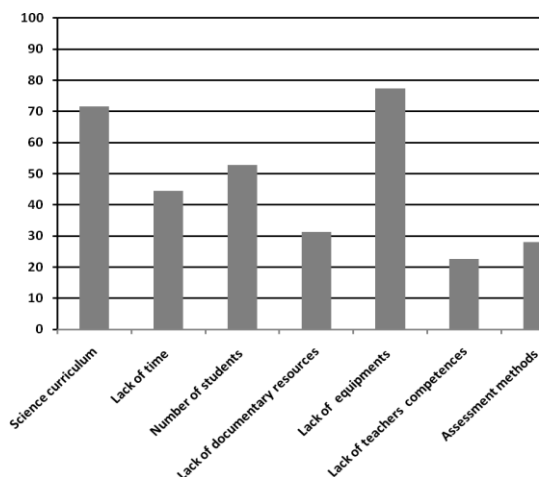


Fig. 3. The main obstacles to an efficient science teaching (in percentage).

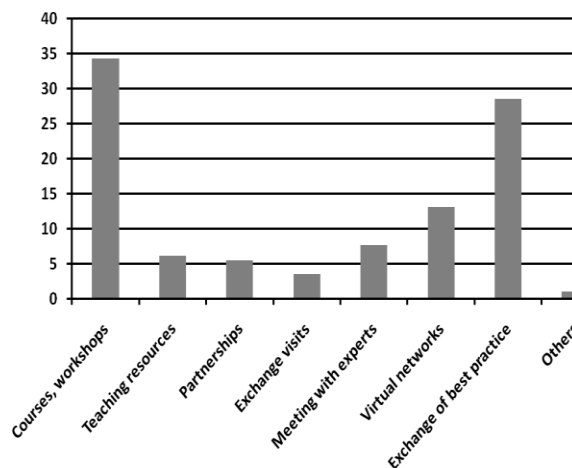


Fig. 4. The major benefits of participation to educational projects for teachers' professional development (in percentage).

4. Conclusions

The paper summarizes our endeavor to clarify some aspects related to Romanian teachers' attitudes in relation to science teaching and their involvement in educational projects. This investigation based on a survey with over 300 participants offers an inside, unbiased view on teachers' problems and priorities concerning their classroom activity, and can provide suggestions for future plans for science education at pre-university level.

Future educational policies have to consider that: (i) Professional development courses/ seminars and workshops are highly regarded by teachers. Here are two comments to be added: (a) such courses are of interest as far as they are offered for free; (b) too many courses on the market make them boring and too formal, they started to bring no so much practical inputs. (ii) Romanian teachers do not perceive educational projects as a mean to build partnerships, networks or to learn from experts. (iii) The Internet and the virtual space play an important role both in teachers' professional development and in the exchange of ideas and practice. (iv) In the last time, teachers started to be more and more interested in conferences, symposia and professional publications. (v) The use of ICT means are quite wide spread in Romanian schools at all levels. More sophisticated tools as digital equipments, sensors, etc. are used in rare occasions. (vi) Despite of the fact that they regard media as a medium

for projects results dissemination, teachers rarely refer in their class work to media materials. (vii) Video and audio means are more and more included in science lessons. (viii) The major obstacles in running efficient and interesting science classes are: the out-of-date curriculum; the number of students in the classroom; the lack of adequate equipment and materials for experimental sessions. Quite a great number of teachers confess that they are developing their own training aids. (ix) Some of the teachers are interested in exchange visits paid along with their students to access some best practice models. (x) Romanian teachers do not understand the important role of projects reports in promoting their experience and results. (xi) Appropriate resources dedicated to modern science teaching and learning have to be designed and distributed to teachers. (xii) In our opinion, there is not an adequate understanding regarding the need to change students' assessment for a modern science education program, especially when teachers are showing interest towards science applied in everyday life situations.

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