1. Illustration of the results of the Teachers' training needs questionnaire

Marina Marchisio analytically illustrates the results of a questionnaire on training needs administered to 2800 Italian teachers of Mathematics, Science, Chemistry and Physics at the beginning of 2015.

The aim of the questionnaire was to verify the status quo both of the perception that teachers have of their teaching practice, and of the quantity and quality of activities put in place in the last two years for their own professional development.

Another aim was to investigate the areas of interest that the teachers have, among those which are the object of the SMART Project (acquisition of STEM - Science, Technology, Engineering, Mathematics - skills, teaching with e-learning activities).

The questionnaire was administered with the aid of the ICT service of the University of Torino that provided an electronic form (toollimesurvey).

The outputs, together with those of the other partners, will be helpful for the development of a European database on training needs and for the definition of common educational models and of one or more possible paths of intervention built on the basis of educational polycentrism.

The questionnaire was administered to the teachers of the two National Projects PP&S (Problem Posing & Solving) and LS OSA-Lab. This choice was made to be sure that the selected teachers were able to understand all questions because through the above mentioned Projects they had already been informed on the change from the old programs to National Guidelines for High Schools, Technical Schools and Vocational Organizations specified by the Ministry of Education (2010). A total of 669 teachers completed the questionnaire.

The preliminary part of the questionnaire contained a series of general questions aimed at assessing the educational, scholastic and environmental background of the teachers that answered.

After the preliminary section of the questionnaire, the first part intended to verify the status quo both of the perception that teachers have of their teaching practice and of the quantity and quality of activities that they selected in the last two years to favor their own professional development.

Questions from 1 to 9 were aimed at ascertaining the teachers' perception of their teaching practice and were organized as follows:

1. Does your teaching action produce significant changes in your students' attitudes ?
2. Are you able to let your most difficult and less motivated students improve?
3. How do you rate your use of time in the class work?
4. To what extent are your didactic choices coherent with your students' interest?
5. How do you perceive the classroom "climate"?
6. How efficient do you rate your practice of students' evaluation?
7. How updated do you consider your disciplinary preparation?
8. How updated do you consider your methodological preparation?
9. How much do you use the new technologies in your teaching action?

The teachers could choose for the answer to each question among five possible levels of a Likert scale, i.e. (from the lowest to the highest level) *difficult, unsure, satisfactory, good, very good*.

The answer whose score distribution showed the lowest values is the second, concerning the self-rating of the ability to let most difficult and less motivated students improve. All the medians are

assessed on level 4 except for the answers to questions 2, 1 and 3 (these last two ones concerning the evaluation of changes in students' attitudes and the use of time in class work), that have median level 3.

Questions 10 and 11 went on in ascertaining the teachers' perception of their teaching practice by considering teaching models and methodologies in the following way:

> 10. Do you consider your teaching practice referable to a traditional teaching model of transmissive type?
> 11. Do you agree with the choice of reducing the quantity of specific Mathematical topics in the Curriculum in favor of cross-curricular links, problem solving and application of knowledge?

The possible answers were in both cases "Partly" (in parte), "No" and "Yes".
Most teachers (72%) involved in the questionnaires judged their teaching practice only partially referable to a traditional teaching model of transmissive type. Only 8% of them agreed with that statement.

Questions 12, sections 1-4, were dedicated to the activities that teachers underwent in the last two years for their professional development. The answers were of the type "Yes"/"No" for all the items in each section. Teachers could of course answer positively to more than one item. We will consider them one at a time.

> Question 12.1: activities of professional development in the last two years
> 1 training courses/seminars
> 2 National/regional programmes of requalification
> 3 observation visits to other schools
> 4 individual research
> 5 online courses
> 6 tutoring experiences
> 7 training practice with other colleagues
> 8 participation to teachers networks
> 9 participation to online communities of practice

The great majority of teachers (around 90%) followed training courses or seminars for their professional development, while less than 10% were involved in observation visits to other schools. It is also interesting to note that quite a conspicuous proportion of the teachers were also interested in individual research (around 75%).

Some teachers declared to have followed other ways for their professional development, among them:

- PP&S or LS OSA projects
- Seminars or congresses
- Masters for teaching trainers
- English courses, some of them specific for teaching in that language (CLIL courses)

Question 12.2: How many days did you dedicate to your professional development activities in the last two years?

More than 65% of the teachers involved declared to have dedicated from 5 to 20 days in the last two years to their professional development, while only around 4% dedicated a number of days less than 5.

Question 12.3: Which of the following topics were the object of your professional development?
1 disciplinary contents
2 use of ICT
3 use of professional SW
4 use of innovative methodologies
5 teaching to students with special needs
6 evaluation practices
7 production of multimedia and online didactic materials
8 didactic planning

The use of innovative methodologies was the topic that obtained the higher proportion of preferences among the objects of professional development (almost 70%). Also the disciplinary contents and the use of ICT were preferred by a good amount of teachers (around 60% and 55% respectively).

Question 12.4: Which training needs were at the basis of your participation to the training activities?

More than 70% of the teachers declared that the deepening of the competences already acquired in their subject was at the basis of their participation to the training activities analyzed in the previous questions. At the same time, a half of them was also interested in the acquisition of new competences in new sectors, while only slightly more than a quarter underwent professional development activities for requalification opportunities.

Some teachers indicated also other training needs that were at the basis of their participation to training activities, among which:

- Personal interest
- The new secondary school-leaving examination
- Search for methods to better the teaching practice from the point of view of classroom climate, work and techniques
- Interest in knowing and comparing teaching experiences in international contexts.

Questions 12.5 – 12.8: Certification, impact, obstacles and incentives of professional development activities

12.5. Did you get a formal certification at the end of the professional development activities?

12.6. Did the professional development activities have an impact on your teaching practice?

12.7. Were there any obstacles in the participation to the activities?

12.8. Were there any incentives for the participation to the activities?

More than 60% of the teachers declared to have obtained a formal certification at the end of the professional development activities. An impact on their teaching practice arising from the professional development was recognized by 85% of them, while 10% revealed to have encountered obstacles in the participation to the activities and for less than 5% there were incentives for the participation to the activities.

Questions 13 and 14 were about the level of commitment of the school in the permanent training and, if positive, added value of permanent training

13. What was the level of commitment of your school in the permanent training?

14. How do you rate the added value of permanent training implemented by your school in the last two years for your personal activity? (please answer only if you rated question number 13 Very good/Good/Satisfactory)

These two questions concerned the level of commitment of the schools in permanent teachers' training. They were Likert items with score (in ascending order) *insignificant, poor, satisfactory, good, very good*. The level of commitment of the schools did not reach as a whole very high scores, while the added value of permanent training, if any, implemented by the teachers' school in the last two years for their personal activity was on the average higher.

The second part of the questionnaire was oriented on the specific interests of the teachers within the areas covered by the SMART project (acquisition of STEM - Science, Technology, Engineering, Mathematics - skills, teaching with e-learning activities). It was then intended to investigate on which activities and subjects the teachers judge relevant for their future professional development and to provide thus a hint into the possible actions to be scheduled.

Questions 15.1 and 15.2 concerned specifically the activities and the subjects for professional development, and were divided into several topics, while in the last section of the questionnaire teachers were asked to choose between a series of possible subjects they could be interested in for deepening their competences.

Question 15.1: Desired future professional development activities

1 Training courses / seminars
2 National/regional programmes of requalification
3 observation visits to other schools
4 individual research
5 online courses
6 tutoring experiences

7 training practice with other colleagues
8 participation to teachers networks
9 participation to online communities of practice

The possible answers for each topic were "Yes" or "No".

Topic 1, the attendance to training courses or seminars, was the most preferred with a proportion of positive answers of more than 60% , while topic 4, individual research, is the least preferred having been selected by less than 20% of the teachers.

Question 15.2: Topics teachers would like to be the object of professional development

1 disciplinary contents
2 use of ICT
3 use of professional SW
4 use of innovative methodologies
5 teaching to students with special needs
6 evaluation practices
7 production of multimedia and online teaching materials
8 teaching planning

Also for this questions the possible answers for each topic were "Yes" or "No".

Topic 4, the use of innovative technologies, was the most preferred with a proportion of positive answers of more than 70%, while topic 5, teaching to students with special needs, is the least preferred having been selected by only around 15% of the teachers.

In the last part of the questionnaire teachers were asked to express their possible interest in a series of specific training actions subdivided on the basis of five training areas: Mathematics, Physics, Science, ICT and Cross-curricular area.

The specific topics for the Mathematics area were the following:

1. Use of advanced computing environments
2. Use of SW of numerical calculation
3. Use of SW of graphical representation
4. Modelling
5. Problem Posing and Solving
6. Specific contents

while for the Physics area they were the following:

1. Modelling
2. Modern Physics.

Teachers showed a clear preference for the training action "Problem Posing and Solving" within the Mathematics area (half of positive answers) while they appeared to be not so interested in the actions proposed within the Physics area.

The topics for the Science area were the following:

1. Integrated sciences

2. Laboratory methodology
3. Poor laboratory

while for the ICT area the following training actions of interest were proposed:

1. Use of e-learning platforms
2. Information security
3. Algorithmic computation
4. Programming languages
5. Management of IT applications.

Laboratory methodology was chosen as interesting by around 26% of the teachers involved, while a little less than 20% chose the action concerning integrated sciences and around 20% poor laboratory.

Use of e-learning platform arouse the interest of almost 30% of the teachers, while only less than 10% showed interest towards information security and slightly more than 15% chose the action in programming languages.

Here the topics were the following:

1. Creativity and innovation
2. Competence evaluation and assessment
3. Development of relational competences
4. Project management techniques
5. Constructivist learning
6. Teaching for students with special needs

The most selected training actions of interest were in this case the actions on competence evaluation and assessment (40% of positive answers) and on creativity and innovation (around 33% of positive answers). Less considered were the actions on development of relational competences and on teaching for students with special needs, that were chosen by slightly less than 20% of the teachers.