Chapter 16
Keeping Pace: Educational Choice Motivations and First-Year Experiences in the Words of Italian Students

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Introduction

Western societies are characterized by continuing developments in technological and scientific knowledge. This phenomenon entails a constant demand for labour in research and innovation fields (Bucchi 2006). It might therefore be hypothesized that there is a similarly significant growth rate in the number of young students wishing to pursue a career in research in scientific institutions. However, since the second half of the 1990s there has been a relative reduction in the number of university enrolments in STEM studies, especially in Physics, Chemistry and Mathematics, in Europe, Japan, the United States, and the more industrialized countries in general (see section "Introduction" to this book).

According to the European survey *Young People and Science*, while four young people out of ten expressed an inclination to enrol in Social Sciences (39 %) or Economics (36 %), less than a third of the respondents showed interest in scientific courses such as Biology or Medicine (31 %), Engineering (28 %), Natural Sciences (25 %), or Mathematics (21 %). In response to a specific question about intention to study Mathematics at the University, the number of students declaring that they "definitely considered studying" Mathematics was 9 %, while in the case of Social Sciences, the percentage rose to 16 % (Flash Eurobarometer 2008). Along with the reduction in enrolments in science faculties, the phenomenon of withdrawal from studies (also termed 'dropping-out' or 'opting-out'; see Chap. 13), also warrants attention.

The drop-out/opt-out issue has been studied and addressed by several projects and initiatives to promote scientific training. In Italy, for example, the *Progetto Lauree Scientifiche* (the Scientific Degree Project) has been developed since 2004 with the support of the Ministry of Education, Universities and Research, the

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Federation of Industrialists, and the National Conference of Deans of Science and Technology Faculties. The project has promoted the strengthening of pre-university counselling, the development of more attractive academic programmes, the use of laboratories to make students protagonists in their learning processes, and the development of internships.

But why is it that young people are enrolling in scientific faculties to undertake research activities in ever-decreasing numbers compared with the number enrolling for other non-STEM subjects? There are a number of factors at work: the type of scientific education furnished in schools, socio-cultural and family conditions, and the social representations of science and technology, which influence the motivations and expectations of students, both male and female (Osborne and Dillon 2008, and several chapters in this book).

Students' Participation in Science, Emerging Issues

A large body of research shows that in Europe, the United States and Japan, the underlying problems in science education are shared and widespread (Bizzo et al. 2002; Bøe et al. 2011; Dove 2010; Sjøberg and Schreiner 2005). There are several reasons for the relative crisis of scientific vocations, including: cultural and social factors; the challenges of teaching science at compulsory school; the difficulty of developing and communicating the social utility and social implications of science; the persistence of gender stereotypes; the problem/resource of the guidance for students; and definition of the student's identity and role.

Primary and secondary scientific education encounters serious difficulties in communicating values, social implications, and considerations which extend beyond an explanation of "how science works" (Osborne and Dillon 2008). This is an obstacle for young people, in particular for female students with an interest in science. The perceived utility value of science plays a central role in young peoples' choices, as demonstrated by the data collected during the IRIS survey. 82 % of Italian male and female students responded that they agreed or strongly agreed on the importance of science as a subject at school. As regards their priorities for the future, they gave a high value – 3.8 on a scale of 1 to 5 – to social commitment: working for something which is important for society as a whole, helping others, and contributing towards sustainable development and environmental protection.

Counselling activities, and those which involve mentoring for students through the process of making choices from secondary school to university and during degree courses, are poorly-developed, and yet cannot be abandoned (Fasanella and Tanucci 2006). They are infrequent in Southern European countries, while it has been found that mentoring – which has been developed above all at English and North American universities – is a driver of learning over the long term, promoting the communication of experiences and supporting choices for the future (Felice et al. 2005).

Uncertainties over future careers should not be ignored in certain disciplines such as physics and mathematics. In Italy, for example, there are few job opportunities for graduates in these two subjects, especially if they have taken extremely

specialized degree courses with the aim of working in high-quality research laboratories. In 2010, with regard to the Italian employment situation of graduates in the area of mathematical, physical and natural sciences 3 years after graduation, 20.8 % were not in employment and were looking for jobs, while the figure at 1 year after graduation rose to 30.4 % of jobless graduates looking for a job (Almalaurea 2011). This condition is different from the situation in other European countries, where candidates from the physical and mathematical sciences are in high demand (see Introduction to this book).

Students' Expectations and Initial Experiences: Quantitative Analysis

The IRIS survey allows us to study certain aspects of the situation experienced by Italian male and female students towards the end of the first year of scientific studies. In this section we focus on one research question in particular: what are the main factors involved in drop-out decisions? We studied a representative sample of 2,667 students enrolled in Physics, Chemistry, Mathematics, Statistics, Biology, Biotechnology, Computer Science and Computer Engineering, Mechanical Engineering, Chemical Engineering and Electronic Engineering. One section of the questionnaire asked them to give an evaluation of the university environment (relationships, organization of studies and teaching, and opportunities for learning). Their assessments enable us to identify the factors which may influence the processes of withdrawal from studies. The data in Fig. 16.1 show the degree of agreement with statements regarding satisfaction with university studies; the area

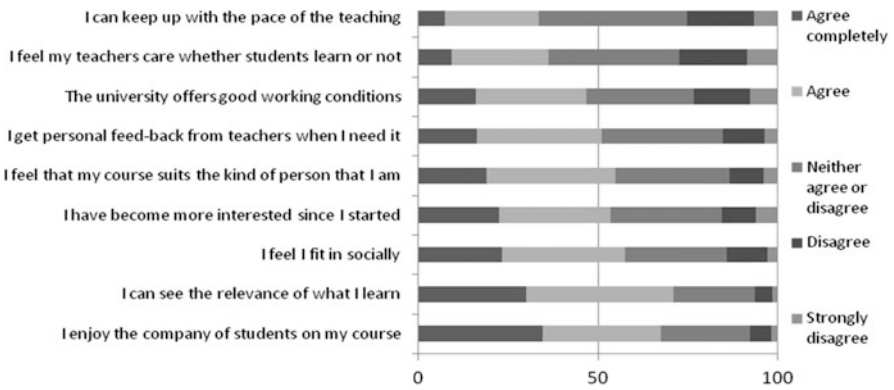

Fig. 16.1 Degree of agreement with statements regarding satisfaction with university studies (n: 2,667) (Source: Young people and scientific pathways; Italian results of the IRIS European survey, March 2011)

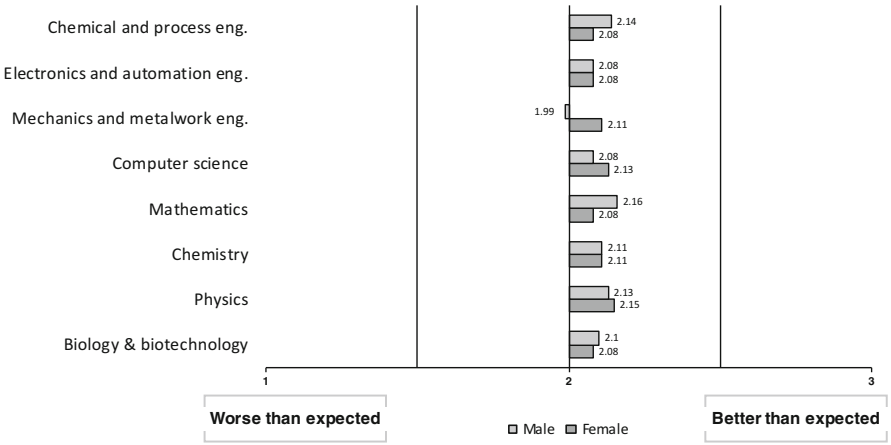

Fig. 16.2 Male-female comparison between expectations and students' experience (n: 2,667) (Source: Young people and scientific pathways; Italian results of the IRIS European survey, March 2011)

where the level of satisfaction was highest is that of social relations. The main challenges, on the other hand, concerned "keeping pace with the teaching" and "getting personal feed-back from lecturers and teachers". This indicates problems related to the learning of content, and the experience that a high level of effort is being made.

The gap between expectations and students' experience is an important factor in measuring the intention to continue with a course or to abandon it (see also Chap. 15) and is also addressed in the IRIS questionnaire. With regard to comparison between initial expectations and experience gained during the first year of the course, one notes a significant level of satisfaction, except for male students on Mechanics and Engineering courses. Figure 16.2 shows an index of five different items; male students of chemical engineering and mathematics show the best level of satisfaction with female students in physics.[1]

Three Determinants of Drop-Out, Opt-Out Intention

The wide range of information gathered on student conditions may be reduced with a factorial analysis to three main dimensions:

- relational well-being, the facility of creating positive relationships with fellow students;

[1] IRIS questionnaire (see Appendix) included five items on students' everyday life: the overall experience of being a student, the social relationship with fellow students, the overall quality of teaching, the interest in the content of the course and the effort to spend on studying.

- results achieved, the student's perception of the level they have reached;
- support from the structure, the well-being obtained from the availability of good structures and support, and attention from the teaching staff.

With regard to relational well-being, one of the most relevant factors was a facility for socializing and for appreciating the company of fellow students as shown in Table 16.1 through a principal component analysis (PCA). This aspect was of great importance for all respondents, especially for those enrolled in Physics, Mathematics, and Chemical Engineering, and it was of greater interest to female students. It was these female students who declared a high level of satisfaction, and who acknowledged that they had developed important relationships. This evaluation is in line with the priorities stated in Fig. 16.1: students, and females in particular, rated social aspects more favourably than other aspects of the study situation.

Concerning the feedback received on learning and the results achieved, males declared a greater level of confidence in their ability to learn, in particular those attending courses in Biology, Physics and Mathematics. These are three disciplines which, compared with the other STEM courses, have a greater female presence, so that we can infer that only the most confident males choose a female-dominated STEM discipline (Table 16.2).

Table 16.1 Principal component analysis of satisfaction with university studies (factor loading greater than 0.30)

Items	Factor 1	Factor 2	Factor 3
I enjoy the company of students on my course			0.89
I feel I fit in socially			0.87
I get personal feed-back from teachers when I need it		0.77	
I feel my teachers care whether students learn or not		0.80	
The university offers good working condition		0.70	
I can see the relevance of what I learn	0.71		
I feel that my course suits the kind of person that I am	0.82		
I have become more interested since I started	0.78		

Table 16.2 Index of self-assessment of one's ability to learn by ISCED and gender (average values, scale 1–5)

ISCED cohorts	Males	Females	Total
Biology and biotechnologies	3.4	3.2	3.3
Physics	3.3	2.9	3.2
Chemistry	3.3	3.3	3.3
Mathematics	3.3	2.9	3.1
Computer science	3.2	3.1	3.2
Mechanical Eng.	3.1	3.3	3.1
Electronics Eng.	3.1	3.1	3.1
Chemical Eng.	3.2	3.1	3.1
Total	3.2	3.1	3.2

As regards evaluations of support from the structure, Italian students attributed particular importance to working conditions, including laboratory activities since the secondary school where they carried out experiments and put into practice what they had learnt in their theoretical lessons. Laboratory work and fieldwork were elements crucial for students' motivational development. This relevance emerges both from a qualitative analysis of the open questions and from the quantitative analysis: the importance of these experiences was fundamental especially for those who enrolled in Chemistry and Biology, and for female students.

Motivation, Interest in the Subject and Risk of Abandonment

An analysis of motivation and interest in the subject reveals important aspects of the student experience. Here we assume that there is a strong relationship between the two elements, given particularly the notion of intrinsic motivation described by Ryan and Deci (see Chap. 2). Students mention motivation when talking about the course as a whole, whereas interest in the subject is one of the main elements mentioned by students when describing their satisfaction levels. The replies to the open-ended questions confirm that recognition of the intrinsic value of the subjects being studied enabled a student to continue with his or her studies and to avoid abandoning them, notwithstanding the considerable amount of work required. In this regard, the choice of a study pathway is developed around a reciprocal relationship between interest and self-representation (Rosenberg 1979), understood as the perception of oneself, which can influence an individual, and therefore his or her choices (Beier and Rittmayer 2009; see also Chap. 3).

We can depict the relationship among interest, self-description and realization in a given area in the form of a triangle: success in a discipline (for example, the positive outcome of a mathematics project) influences perception of one's potential in this field ("I'm good at mathematics"), which has a positive effect on interest (Beier and Rittmayer 2009; Guay et al. 2003). An increasing interest in the subject leads to a search for increased achievement in the field.

Lessons on the practical applications of science also heighten interest and reduce drop-outs (see next section). It should be recalled that during adolescence, and in the successive phases during which the choice of an educational pathway matures, it is fundamental for boys and girls to provide an answer to the question "what is the usefulness of my actions?", and therefore to consider the practical effects of scientific studies (Eccles and Wigfield 2002).

For the purposes of an analysis of the drop-out and opt-out mechanisms, it is important to consider the number of students who faced a situation which was worse than had been anticipated (see Fig. 16.2 for an overview): a percentage between 8 % and 13 %. Males encounter more unexpected difficulties in Computer

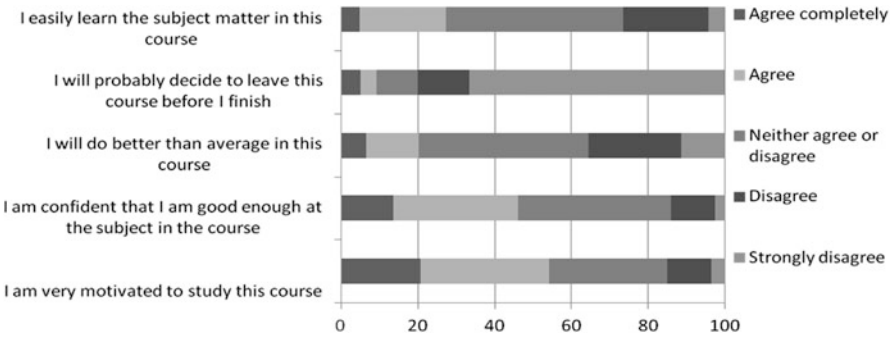

Fig. 16.3 Level of agreement with statements on present and future academic performance (n: 2,667) (Source: Young people and scientific pathways; results of the IRIS European survey, March 2011)

Science and Mechanical Engineering, while it is women who face more problems with Chemical Engineering.

Figure 16.3 shows the level of satisfaction with academic performance and perceived learning level. A minority of respondents (fewer than 1 in 10) saw themselves at risk of abandoning the course, notwithstanding the fact that the course work was regarded as onerous in the vast majority of cases. Only one-fifth of the sample thought that they would obtain better than average results; only a quarter learnt subject matter easily on the course; and less than half were confident that they were good enough in the subject. Furthermore, many respondents placed themselves in the middle of the scale, thus expressing uncertainty about their academic futures. What seems to prevent a greater tendency towards abandonment, despite the considerable effort required in the courses, is the students' motivation: more than half of the respondents stated that they were highly motivated to study the course subjects.

The greatest likelihood of dropping/opting out was indicated among students enrolled in Biology, where the share of students who manifested doubts about completing their studies represented over a quarter of the sample. It should be made clear that many female students had selected Biology as their second choice; their first, at the moment of enrolment, was medicine, which in Italy requires an admission test. These students therefore intended to leave Biology in order to retry the admission examination for Medicine. The two cases where the intention to abandon was instead the lowest were Physics and Mathematics. With regard to Computer Science, it was female students who expressed more uncertainty about the future, while in Mechanical Engineering, the (very few) female students were nearly all sure that they would complete their studies.

Evaluating the Course Experience: Qualitative Analysis

Together with the quantitative analysis of the data, a qualitative analysis of replies to an open-ended question provides important insights into the experiences of male and female university students. The Atlas.ti program was used to study the 2,192 open responses to the question "If someone you know were thinking of enrolling on your course and asked you about it, what would you say to her or him?", using labels which made possible a macro-categorization based on the achievement-related choices interpretative model developed by Eccles (1994). The opinions expressed in responses to this question can be classified into three groups: those who regret choosing their course, those who value it positively, and those who take an intermediate position, suggesting the risks and the potential. From the dissatisfied replies, we can therefore gather the factors which are crucial to course abandonment; while from the positive and enthusiastic responses, we can find the reasons for continuing. The intermediate replies show more balanced positions, but they are often highly uncertain.

In order to study the drop-out and opt-out processes, we used the dimensions of the achievement-related choices model (Eccles et al. 1983; see also Chap. 2): interest value, which is used to gain an understanding of all the elements of a subject involving interest and pleasure; attainment value, which concerns statements referring to achievement values and strong identification with the duties and the role of the scientist, also in "vocational" terms; utility value, the aspects of individual usefulness in relation to a person's development project; and perceived cost, or the weight given to the costs which must be sustained in order to complete a course of study.

We finally analysed the responses with particular regard to the learning environment (student relations and teachers' role) and to external factors (future job opportunities).

Enjoying Science: Interest Value

The quantitative data showed that intrinsic interest in the subject was a strong factor in pursuing a scientific career. Many respondents used emotive adjectives such as "fascinating", "exciting", "stupendous" and "great", and intensely emotive nouns such as "passion", "interest", and "pleasure":

> The course is very interesting, and "enjoyable" in certain ways, because it's always possible to see and feel what you have studied. It's very hard because of the effort and workload (female, Chemistry)
>
> Independence in one's studies is the key element in scientific faculties, and chemistry is no exception. If you're curious and chemistry reflects your passion and the career you would like to have in the future, this is the degree course for you (male, Chemistry)

Intrinsic interest was cited as a priority especially by Physics, Chemistry, Biology, Biotechnology, and Mathematics students, males and females alike. This is probably due to their greater difficulty in finding jobs compared with their colleagues enrolled in Engineering and Computer Science, for whom utility and career move are the absolute priorities

> Interesting, and an excellent choice for the future, since electrical engineers are sought after and well paid because they are in short supply, although it is currently one of the most demanding degree courses (male, Electrical Engineering)
>
> As a course which provides great mental training, which prepares us for the problems of every day in what will be our profession one day male, Mechanical Engineering)
>
> Important! We learn to be the engineers of tomorrow (male, Computer Science)

Fitting the Identity: Attainment Value

Besides the condition of students on a university course, consideration must also be given to the issue of constructing a distinctive identity (Illeris et al. 2002; see Chap. 3), which is especially significant during the phase of choosing a future career. Transmitting the most interesting, pleasant self-image possible is important for young students, and the choice of a course is therefore connected with the perception that the course is interesting as to content, future expectations, and identity.

There are numerous responses with a powerful vocational connotation. The aspect of science as a "life choice" is present, and is cited most often by Chemistry, Physics, Mechanical Engineering and Biology students:

> Incredibly difficult, but if this is what you want to do with your life, I would recommend it, because it's the best (male, Mechanical Engineering)
>
> Very demanding, but important for both educational and personal growth (female, Mechanical Engineering)
>
> A course for those who want to learn the truth about the world and everything that surrounds us (male, Biology)
>
> Useful, demanding: a life choice (male, Mechanical Engineering)

For many students, especially those studying Physics and Mechanical Engineering, the inevitable problems of studies and workload were overcome by strongly recognising the significance of the subject being studied, as regards both the level of interest and personal and cultural growth:

> Very demanding, but important for both educational and personal growth (female, Mechanical Engineering)
>
> Helps us to understand the world around us, and create a personality which is critical, curious and always in search of the truth (male, Physics)
>
> Great, if one recognizes the fact that one is studying the most important thing that there is (male, Physics)

Students who are highly motivated to study in order to fulfil themselves are unlikely to abandon their studies or to opt for a different course because of the cost of success.

Planning the Future: Utility Value

An analysis of the need to reach external goals, which a large majority of the respondents believed to be important and inevitable in terms of efforts (using terms such as "demanding", "tiring", and "difficult") shows that it was considered to be tolerable when there was a high level of recognition of professional utility and passion for the subject:

> It is a difficult course to follow because the issues are very complex, but it offers good training for the near future (male, Mechanical Engineering)
>
> I would certainly describe it as more demanding than it might appear. The amount of time devoted to studying is very considerable. But I think it's a very interesting course, and useful for the future (female, Biology)

With regard to opt-out, a considerable number of students stated that they would like to change course and apply to a different faculty. This was primarily true for Biology, and in particular women rather than men. This is apparent from the replies to the question "Describe how you came to choose this course", to which around 100 male and female students answered that they had selected it as a second choice because they had not passed the Medicine admission test. In some cases, after attending the classes, and appreciating the subject and the organization of the Biology degree course, they might decide to continue along this route:

> An excellent course which prepares you well for the medicine admission exam. It offers stimulating subjects with great attention to the practical aspects (male, Biology)

Most of those who had selected their university course as a second choice were motivated to retry the medicine route; for some, the intervening year might have been experienced with a sense of inadequacy and demotivation, which was often the case of female students:

> It is a course to be chosen if you have a passion for it, and not to opt out of a medicine exam which went badly! Biologists accept themselves; failed doctors don't! (female, Biology)
>
> It's a very interesting course which must not be undervalued. It needs to be selected consciously, and not as a second choice. It is very demanding, and so one needs to have a serious predisposition for it (female, Biology)

The Right Effort: Perceived Costs

Considering the resistances and difficulties in pursuing a course of study, the students especially emphasised the perceived cost. More than a third of the respondents referred to the effort required, another group referred to difficulty, and many spoke of "complex" or "complicated" courses.

Few students passed a clearly negative judgement on their university course, but it is interesting to describe how they expressed this judgement. First of all, they cited factors such as workload (within the perceived cost dimension), using words such as "fatigue", "stress", "tough", and "sacrifice". From an expectancy-value

perspective, the burden of taking part in an activity – the cost – is the price to be paid for bringing a task to its conclusion. Completion of the task is closely correlated with a person's reaction to the cost to be sustained (Eccles 2005; see also Chap. 2):

> Too heavy, and mentally destructive (male, Chemistry)
>
> Hard with regard to the sacrifices we make for our studies, due to stress factors and sometimes frustration with others, requires motivation and will-power (male, Mechanical Engineering)

It is apparent that many responses, even the most positive ones, refer to cost, in terms of effort, energy, and workload. Nonetheless, as also found by the quantitative analysis, effort is compensated for by a strong interest in the subject and/or practical motivations, such as job prospects. Many students associated problems with the subject with its fascination:

> Demanding but fascinating, and repays being taken (male, Physics)
>
> The course is very demanding, but if one is highly motivated, or at least interested, it is not hard to keep up with the teachers (female, Biology)
>
> More difficult than I had thought, but very, very fascinating (male, Physics)

The Learning Environment, Student-Teacher Relationship in the Tertiary Education

Students often mentioned the relational context: when considerable results-based competitiveness is created, it is more likely that elements of cognitive and emotional tension will make progress difficult:

> Most of my colleagues disrupt the classes. The teachers are often not up to their jobs (male, Electronic Engineering)

This is a kind of two-faced Janus, however. Competition is seen by others as a motivating factor. Although the workload has a significant influence on students, if it is linked with a strong interest in the subject, it is unlikely to become a drop-out factor. The students' accounts highlighted a number of crucial factors: the teaching methods, or the quality of the teachers, and their ability to support students, both male and female.

Group work was fundamental, especially for female students in Biology, Mathematics and Chemistry. Group work allowed for active involvement, and an open exchange of ideas by using experimental methods. This element was to be desired above all in courses where laboratory use was crucial, such as Biology, Biotechnology, Chemistry, Computer Science, and Physics. Learning how to work in a group was also mentioned as important:

> My course enables students to fully understand the why of what surrounds us, the right approach to a life that is waiting for you. Learn how to be practical and work in a group in an organic way (female, Chemical Engineering)

In courses involving group work, practical research in the laboratory, and fieldwork, involvement was held to be a strong point of a university career:

> My course lets me acquire a deep understanding of what is around us, the right approach to the life which awaits us. It teaches us to be practical and how to work in a group systematically (female, Chemical Engineering)
>
> You are never bored, between practical classes in the laboratory and theoretical classes. You test your practical abilities from the start, and you understand if you have a talent for the subject or not (male, Chemistry)

The role of well-prepared teachers able to guide, motivate and support their students was regarded as decisive, as was the use of involvement methods which stimulated participation:

> It's great. The teachers motivate you. We do laboratory work and go on trips which help us better understand what we are studying in the books (female, Biology)
>
> An excellent course. The teachers are very good, and always available to help their students (female, Electronic Engineering)

We now consider some critical responses on the role of teachers:

> As regards organization and the teaching and explanation methods of certain teachers, I would recommend not enrolling (female, Biology)
>
> Interesting, but unfortunately not much help is given to those who don't have the basics from high school, and this causes demotivation (female, Chemistry)
>
> Disorganized, disorienting, and difficult, with professors who are not very helpful and are too abrupt with the students, but maybe this is one of the few ways to guarantee yourself a future (male, Electronic Engineering)
>
> No good if you don't like chemistry, and somewhat 'improvised' by the teachers. Two of the seven I have come across so far didn't seem to me of university quality (male, Chemical Engineering)

Discouragement due to inadequate teaching methods was cited by a minority, but this aspect is fundamental for analysing the opt-out and drop-out processes. A quantitative analysis of the Italian IRIS questionnaire, in fact, shows that one student in two of those who enrolled in Mathematics, Electronic Engineering and Chemical Engineering attributes a significant role to good high school teachers, and this figure increases for Physics and Chemistry. Significantly, females enrolled on university courses in Biology, Biotechnology, Physics and Chemical Engineering most clearly state that their teachers have a strong influence on their university careers.

The role of teachers therefore appears as a key element in educational choice, both for enrolling and for staying on in STEM higher education, especially for female students. The significance of the teacher/female student relationship takes root at the time of compulsory education, and through secondary school: in this phase, physics, chemistry and mathematics teachers are mostly women and, curiously, a certain disaffection on the part of female students towards science may be attributed to the part played by certain teachers in perpetuating gender stereotypes by offering greater support to males at the expense of females (Jones and Wheatley 1990; Liu 2006).

Future Job Opportunities

One reason for the possible abandonment of studies mentioned almost exclusively by students enrolled in Biology, Physics and Chemistry, and mainly by women, was the lack of post-degree job opportunities, which can be a strongly demotivating factor:

> I would describe it as a useless faculty, because it provides few opportunities for the future (female, Chemistry)
>
> As a course which doesn't offer many job opportunities in Italy, and with very little benefit (male, Biology)
>
> Interesting and fascinating, but few job opportunities (male, Physics)

Considering the complexity and the effort which scientific degree courses demand, it is especially important to be able to rely on satisfactory job opportunities upon graduation. Professional utility is an essential factor for balancing the costs and the sacrifices required. When this sense of utility is lacking, only students with exceptionally strong motivation manage to continue:

> It is a demanding course, but one which does not guarantee high economic rewards. So if you want to enrol you must do it with passion (male, Chemistry)

Conclusions

Having analysed the quantitative data and the qualitative materials, and having earlier summarized the international, European and Italian situation regarding scientific vocations, we now briefly describe the elements which might help combat drop-out and opt-out processes.

Motivating and orienting young people in the choice of university studies is one of the main challenges. Support from guidance services in the pre-enrolment phase is important, as well as within the university. This is because educational choice is a complex process which is ongoing, even after enrolment, and is characterized by constant reflection on the choices made.

Given the beliefs, values, experiences, and the reasons proposed by students, it is very important that teachers should use the most participative teaching methods with effective feedback procedures in order to enhance the students' capacity to deal with scientific content: the provision of clear explanations is a key factor which respondents remarked on frequently.

Teaching staff need to support and dedicate attention to students' diverse needs concerning teaching and learning styles and preferred ways of communicating. This introduces the topic of mentoring or other forms of tutoring, which have been shown to be extremely useful (above all for female students) in keeping up with classes and examinations. One answer among many, from a female mathematics student, clarifies the role of a university open to the needs of individual students: "It's hard, you need to have a lot of passion, you have to like mathematics, like it a

lot. You also need to be diligent and constant in your studies, so you can manage to keep up. The environment helps a great deal – the teachers, the teaching assistants, and the tutors are very helpful".

It is important to consider the transition between university and the working world so that professional expectations are made real and credible. Job opportunity problems for graduates in Physics, Chemistry and Mathematic partly discourage students. An interest in, and passion for, the subject motivate enrolment in science faculties, but the choice must be made in line with other factors, such as professional attainments and career aspirations. Competition and cooperation can be seen as two sides of the same coin, and it should not be thought that one is independent from the other. The scientific enterprise is fuelled by elements of conflict and confrontation together with moments of full and constructive exchanges of opinion.

Finally, developing a good relational climate can enhance cooperation among students. It offers the opportunity to share comments and proposals on learning difficulties, considering that teamwork is especially appreciated by female students (see also features of the Tinto model in Chap. 13). This is demonstrated by the fact that Biology and Biotechnology – where group work is common, for example in laboratories – record only a few cases of abandonment (on the other hand, cases of opting out due to a choice preference for medicine are more common, as we have seen). Of course, not even the most positive relational situation among coursemates can eliminate the inevitable difficulties, and it would be superficial to think that all the difficulties involved in learning and adaptation processes can be remedied.

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