IS THERE A SHORTAGE OF STEM TEACHERS IN EUROPE?

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Abstract

The 2015 report “Efforts to increase students’ interest in pursuing Science, Technology, Engineering and Mathematics studies and careers” by Kearney, C., devoted a short chapter to initiatives identified in 30 countries surveyed across Europe related to the recruitment of STEM teachers. It found that 37% of countries (BG, CH, DK, FR, HU, IL, LV, NL, SK, SE, and UK) report that initiatives are planned or in place to address the issue of recruiting more STEM teachers in schools, particularly at secondary level. Are the countries which reported national initiatives in this area, the only ones facing a shortage of STEM teachers? What are the main reasons behind this shortage and are these reasons similar across countries? Why are other countries not facing a shortage? These are the additional questions that this present article addresses, to complement the first analysis provided in the aforementioned report, and to probe the issue further.

To attempt to answer these questions, the article reports on two recent information gathering activities which took place during February – March 2016: 1) a questionnaire to Scientix National Contact Points concerning whether there is a shortage of STEM teachers at national level and asking the reasons for this; and 2) an online survey to the Scientix Teachers Panel concerning the situation of STEM teacher recruitment in their own school and local schools. These information sources complement one another, as the results of the first questionnaire give an indication of the situation as it is understood at national level, while the second survey investigates the issue from the perspective of STEM teachers currently teaching in various countries across Europe at local level. It should be noted that these surveys were completed on a voluntary basis, meaning that not all countries are accounted for, and the level of detail provided by the answers varies from country to country. Nevertheless, the article succeeds in providing a snapshot of the current situation. While a certain number of countries clearly suffer from a shortage of STEM teachers and have reacted to the situation by implementing one or more initiatives specifically to target the issue, this is not the case for the majority of countries. Interestingly the article reports that some countries do not have sufficient evidence to be able to state whether or not there is a shortage of STEM teachers as this information is not collected in any systematic way at national level. Other countries indicate they do not currently face a shortage, but that a large proportion of the current STEM teaching population will shortly retire, and therefore such a shortage is likely to appear in the coming years.

Keywords: STEM, teachers, shortage of teachers, recruitment of teachers, policy, national initiatives.

Is there a shortage of STEM teachers in Europe?

The situation regarding STEM teachers at school level across Europe was most recently investigated by European Schoolnet in the 2015 report “Efforts to increase students’ interest in pursuing Science, Technology, Engineering and Mathematics studies and careers” by Kearney, C. The chapter devoted to this issue in the aforementioned report focused on current or planned initiatives in place to recruit more STEM teachers at national level. It did not
however explore whether or not there is a perceived shortage of STEM teachers at national level in countries across Europe, or whether indeed there is evidence to support such claims. Nor did it look at the reasons for this shortage in different countries. This article aims to answer these further questions. To do so, the article reports on two recent information gathering activities which took place during February – March 2016: 1) a questionnaire to Scientix National Contact Points (NCPs) concerning whether there is a shortage of STEM teachers at national level and asking the reasons for this; and 2) an online survey to the Scientix Teachers Panel concerning the situation of STEM teacher recruitment in their own school and local schools. These information sources complement one another, as the results of the first questionnaire give an indication of the situation as it is understood at national level, while the second survey investigates the issue from the perspective of STEM teachers currently teaching in various countries across Europe at local level.

It should be noted that these surveys were completed on a voluntary basis, meaning that not all countries are accounted for, and the level of detail provided by the answers varies from country to country. Moreover, for some countries information was provided by a national representative as well as one or more teachers reflecting on the situation at local level, while in other countries one of the two was provided only, and some countries provided no information at all. It is for this reason that this article is unable to give a comprehensive and accurate view of the situation in each country in Europe. Nevertheless, it provides a useful snapshot of the current situation. Information has been included and analysed in countries where data was provided concerning the national and local situation, or just the national situation, as this can be considered to be adequately representative for the purposes of this article. Countries however where no national representative was able to give an overview and only one or two teachers provided information about their local perspective, were not considered for this article, as their isolated opinions cannot be said to be representative in any way. The article analyses data provided by 16 Scientix National Contact Points (the Netherlands, France, Finland, Turkey, Cyprus, Estonia, Malta, Poland, Romania, Slovenia, Croatia, Czech Republic, Ireland, Spain, Switzerland and Latvia) who answered the short survey concerning the situation at national level, and 33 Scientix teachers from the same group of countries who answered the survey focusing on the situation from their local perspective. No teachers from the Netherlands or Malta answered the survey.

Out of the 16 NCPs that answered the survey, four countries expressed that there is a lack of STEM teachers at national level (the Netherlands, France, Finland and Turkey). Concerning the Netherlands there are various sources of evidence testifying this lack, notably the Technology Pact and the associated Technology Pact Monitor, the Teachers’ Agenda, and the data which is responsible for the various programmes in place to attract more STEM graduates to the profession (see Kearney, C. (2016). Efforts to Increase Students’ Interest in Pursuing Mathematics, Science and Technology Studies and Careers. National Measures taken by 30 Countries – 2015 Report, p. 36-37). Interestingly, in the case of France, while it is possible to state that there is a certain lack of STEM teachers, this is not because of a lack of interested STEM graduates, like in the Netherlands or in other countries. On the contrary, recent statistics show that there are more applicants than teaching posts available for the STEM subjects. The shortage is accounted for by the fact that those applying sometimes do not have the required level to qualify, and are therefore not accepted. In 2015 for example, only 11,393 STEM graduates were admitted to participate in the national teaching competitions, despite there
being 11,728 vacancies, resulting in a shortage. Two Scientix teachers answered the survey concerning their local experience of the situation in France, with one stating that STEM teacher recruitment was an issue at their own or nearby school, while the other stated this not to be the case.

In **Finland** a recent large-scale national survey (carried out by Statistics Finland every two to three years) called ‘Teachers in Finland 2013’ reported there to be problems concerning the recruitment of STEM teachers at national level. The report published in 2014 states that there is a lack of qualified mathematics teachers. Moreover, many STEM teachers will retire in the following years. Universities are currently facing difficulties to get enough students to join their STEM teacher programmes. The one Finnish teacher who provided information concerning their own school and local schools, stated they were not aware of any recruitment issues. Finally, in **Turkey** the General Directorate of Human Resources for the Ministry of Education provided recent statistics concerning the actual number of STEM teachers across the country, and the number required. There can be said overall to be a shortage of around 5%. Most particularly, there is a notable shortage of mathematics teachers at primary level, as well as general Science teachers at secondary level. At local level, two out of the three Scientix teachers confirmed that this is the situation in their own school or one in their local area.

Six countries (**Cyprus, Estonia, Malta, Poland, Romania and Slovenia**) remarked that at national level there is no shortage of STEM teachers. **Malta** is able to confirm this on the basis of data coming from the Human Resources department within the Directorate for Quality & Standards in Education, while **Slovenia** based its answer on consultations with relevant staff working at the Ministry of Education, Science and Sport and the University of Maribor, as no data is available at national level. Two Slovenian Scientix teachers confirmed that they are not aware of any shortage of STEM teachers in their school or in any other school in their local area.

Interestingly, Romania and **Poland** both mentioned that they are not facing any shortage of STEM teachers at national level because of a recent decrease in school pupils. In Poland, during the period 2000-2013, the number of pupils has decreased from 7.1 million to 5.1 million. During this time however, the number of teachers has increased by 8%. Similarly, in **Romania**, since 2002, the number of students in lower secondary schools has continuously decreased. As a consequence, over the last decade, in upper secondary schools, the number of mathematics and sciences classes, as well as the number of classes in technological high-schools has also decreased. In the countryside, the effect has been particularly significant, with some schools being forced to close due to an insufficient number of students, also caused by many families moving to larger cities. For this reason, there has recently been a period of time when there was in fact been an excess of science teachers, particularly in Physics and Chemistry. The lack of shortage of STEM teachers at national level is confirmed by three out of four Scientix teachers working in schools in Romania, and one out of two teachers answering about the local situation in Poland.

Another country which interestingly highlights an excess of STEM teachers is **Cyprus**. This is evidenced by the country’s teachers’ appointment lists of the educational service commission which illustrate that many STEM teachers are still waiting to get hired by the Ministry of Education of Cyprus. Having said this, one Scientix teacher from Cyprus underlined that there can be an issue at primary level, according to their local experience. This is because while all
primary school teachers are qualified to teach all subjects, it is often not their favourite subject, so when head teachers have to make the schedule and arrange which teacher will teach each subject in each grade, it can be difficult to find teachers willing and available to teach the Science subjects.

**Estonia** also claims currently not to be exposed to a shortage of STEM teachers at national level. This is confirmed by the one Estonian teacher who provided information concerning their experience of the issue at their own and local schools. However, it does appear that a lack of STEM teachers will soon be a challenge for the country as currently the average age of Estonian teachers is a little less than 48, and about 16% of teachers are over 60. Moreover, 46% of teachers currently teaching STEM subjects at vocational schools for example are of retirement age. The success of the Estonian economy has been detrimental to Estonia’s teaching force, since the opportunities for highly educated Estonians in the private economy, especially in the STEM areas, are far more attractive than teaching which has a very low salary (the second lowest in the OECD countries).

Interestingly, the approaching threat of teachers retiring in the near future and causing a shortage of STEM teachers, was mentioned by five countries (Finland, Estonia, Romania, Turkey and Latvia). Like Estonia, **Romania** also is not currently facing a lack of STEM teachers, but also predicts that in 5 to 10 years’ time, it is likely they will be confronted with such a challenge when a large proportion of their STEM teaching staff begins to retire. The retirement of STEM teachers each year was also mentioned as an issue in **Turkey**. Lastly, **Latvia** also has concerns about its ageing STEM teaching body. Recent statistics from 2013-2014 show that around 60% of Science teachers and 55% of Mathematics teachers are aged 55 or older. This means that there will surely be a shortage of Science and Mathematics teachers in Latvia in the near future. The two Latvian teachers who provided information concerning their experience of the issue at local level both claimed that they are aware of a shortage of STEM teachers in their own or local school, without mentioning teachers’ retirement as the cause. Rather, they mentioned the problem specific to schools in their rural areas, which are sometimes closed down as families move to the bigger cities (as in Romania – see above), coupled with the problem of teachers in these rural schools being expected to teach more than just science subjects.

Six countries (**Croatia, Czech Republic, Ireland, Spain, Switzerland and Latvia**) state that they are not able to determine whether or not there is a shortage of STEM teachers at national level, often because such data is not collected at national level. In the case of **Switzerland** for example, cantons are in charge of education and for this reason, there is very little data concerning the shortage of teacher at national level. Some cantons do however collect this information, and those facing shortages have their own programmes to deal with this. At national level however, it is possible to state that there will be a general shortage of teachers in the years 2018-2022 in half of the cantons for primary schools and almost all cantons for lower-secondary schools, according to the prognosis of the Federal Statistical Office. **Ireland** is another country which does not collect this information at national level, as teacher shortages are considered to be an issue for each individual school, and therefore any shortages are known to them, but are not necessarily communicated to the Department of Education or any national agency. The one Irish Scientix teacher who shared their local impression of the
situation remarked that they were not aware of any STEM teacher recruitment issues in their own or nearby schools.

**Croatia** also remarks that the Ministry of Science, Education and Sports does not systematically collect information concerning any potential shortage of STEM teachers. However, they do collect data about the number of non-fully qualified teachers currently teaching all subjects, including STEM, and this can be considered as an indicator of a potential shortage i.e. if there are a large number of non-fully qualified teachers teaching STEM subjects this would indicate a likely shortage of qualified teachers. In Croatia, such non-fully qualified teachers only amount to around 1%. Three Croatian Scientix teachers provided information from the local perspective, and all agreed that there is a shortage of STEM teachers in their own school or local area. The main reasons provided were the low status of teachers and the poor salaries.

**Finland** also collects information concerning the number of unqualified teachers teaching at national level, and in 2013, 5% of STEM teachers at primary and secondary level were not qualified. Although Estonia does not compile statistics to be able to provide a precise percentage, it also mentions that particularly in secondary schools, not all STEM teachers have the appropriate qualification to teach their specialized area of STEM.

The **Czech Republic** states that there is no evidence concerning the shortage of STEM teachers at national level, and that statistics related to the issue are not compiled. Three Czech teachers provided us with information from their local perspective, and all three agreed that there is a shortage of STEM teachers at their own or nearby schools, and that recruitment is difficult. The reason for this difficulty they all agreed on, is the demotivating low salary teachers receive in the Czech Republic, which is less than the national average salary. **Spain** notes that the Ministry of Education has data on the number of teachers overall in Spain, but this data is not available by subject, so it is not possible to state at national level whether or not there is a shortage of STEM teachers. At local level, five out of six Spanish Scientix teachers remarked that the recruitment of STEM teachers did not appear to be a problem in their school or those in their local area. **Latvia** is in a similar situation to Spain, as subject-specific information concerning serving teachers is not publicly available. It should be noted, that three countries reported on earlier (**Estonia, Poland and Slovenia**) who all claimed on the basis of other evidence sources that there is no perceived shortage of STEM teachers at national level, also highlight that national statistics precisely on this issue are not available.

**Conclusions**

The results of this article demonstrate that the situation concerning STEM teachers varies across Europe. Four countries (**France, the Netherlands, Turkey and Finland**) mentioned that there is currently a shortage at national level, while six countries (**Cyprus, Estonia, Malta, Poland, Romania and Slovenia**) stated this not to be the case, even though some of these countries highlighted the approaching retirement of STEM teachers as likely to result in a STEM teacher shortage in the near future. Worthy of note, is that out of the 16 countries analysed, the majority (56%) stated that data concerning a potential shortage of STEM teachers is not collected at national level (even if three of these countries still felt able to conclude that there is no shortage at national level, despite the lack of data). Considering that
these countries currently with no data are also predicting a shortage of STEM teachers in the future (principally due to the approaching retirement of STEM teachers and the inability to attract large numbers of fresh graduates to the profession), it would seem wise that they start putting instruments into place in order to collect data concerning the current number of teachers per STEM subject, the number applying to become STEM teachers versus the number of vacant positions, the number succeeding, and those expected to retire. This data would not only help them observe important trends with certainty and authority, but it would also provide their national governments with solid evidence to justify investing in measures to tackle the problem.

It is worth mentioning that the majority of countries (both at the national level represented by Scientix NCPs, as well as at the local level represented by the Scientix Teacher Panel) highlighted the low salary of teachers in their countries as a major reason for many STEM graduates not choosing to enter the profession. In an era when science and technology continues to increasingly play an important role in society, it is of utmost importance that a sufficient number of well trained teachers take on the responsibility of educating our scientists of the future. Moreover, as well paid jobs in this sector are set to continue to expand, STEM graduates will increasingly have a selection of highly stimulating and well remunerated jobs to choose from. This being the situation, the teaching profession cannot afford to offer STEM graduates an unappealing low salary in the face of such competition. The only type of financial incentive identified by the Kearney Report (see p. 35-38) were scholarship schemes available in a small number of countries (Israel, Slovakia and Hungary), aimed at attracting students to study STEM teaching at university. This however, is a short-term incentive. While some STEM graduates may be allured by scholarships paying for the majority of their studies, it is likely that governments will have to invest in higher teaching salaries to ensure a long-term commitment of highly educated graduates ready to contribute to this worthy profession.

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