

# EGU (European Geosciences Union) Education Field Officer programme: teachers' appreciation, perceptions and needs

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*Whilst geoscience plays a critical role in society and in sustainable development, it is nevertheless a neglected subject in many European countries. To address this issue, the European Geosciences Union (EGU) launched an initiative for the dissemination of professional development workshops aimed at teachers with limited or no academic background or teachers training in geoscience. The initiative included the training and funding of six Education Field Officers in 2019, who would then run practical workshops in France, India, Italy, Morocco, Portugal and Spain. The workshops were based on the experience and teaching resources developed by the Earth Science Education Unit (ESEU, Keele University). In this article we focus on the outcomes of the workshops and on the perceptions and needs of the teachers who attended.*

*Si les géosciences jouent un rôle critique dans la société et le développement durable, elles restent néanmoins un sujet négligé dans de nombreux pays européens. Pour résoudre ce problème, l'EGU a lancé une initiative pour la diffusion de workshops de développement professionnel destinés aux enseignants de formation académique limitée ou inexistante ou des enseignants formés en géosciences. L'initiative comprenait la formation et le financement de six agents de terrain de l'éducation en 2019, qui organiseraient ensuite des ateliers pratiques en France, en Inde, en Italie, au Maroc, au Portugal et en Espagne. Les ateliers étaient basés sur l'expérience et les ressources pédagogiques développées par l'Unité d'Education aux Sciences de la Terre (ESEU, Université de Keele). Dans cet article, nous nous concentrons sur les résultats de ces workshops et sur les perceptions et les besoins des enseignants qui y ont participé.*

*Si bien las geociencias desempeñan un papel fundamental en la sociedad y en el desarrollo sostenible, son sin embargo, un tema descuidado en muchos países europeos. Para abordar este tema, la Unión Europea de Geociencias (EGU por sus siglas en inglés) lanzó una iniciativa para la difusión de talleres de desarrollo profesional dirigidos a profesores con escasa o nula formación académica o con formación de profesores en geociencias. La iniciativa incluyó la formación y financiamiento de seis oficiales de educación de campo en el año 2019, que luego realizarían talleres prácticos en Francia, India, Italia, Marruecos, Portugal y España. Los talleres se basaron en la experiencia y los recursos didácticos desarrollados por la Unidad de Educación en Ciencias de la Tierra (ESEU, Universidad de Keele). En este artículo nos enfocamos en los resultados de los talleres, en las percepciones y necesidades de los profesores que asistieron.*

## Introduction

In the 1990s a widespread lack of geoscience knowledge and understanding among students of different ages

emerged in Europe and beyond (King *et al.*, 1995). Since then this issue has been repeatedly investigated by the International Geoscience Education Organisation (IGEO) through international surveys, which confirmed the result of previous studies, with increasing negative trends in recent years (King in UNESCO, 2019). Another independent international assessment – covering 47 countries – TIMSS 2015 – demonstrated that among students aged 9-10 Earth science results overall were poorer than those of the other areas of science (Martin *et al.*, 2016).

In Europe the problem of improving geoscience education was addressed by the European Geosciences Union (EGU) through its Committee on Education with the development of a 'Strategy for Enhancing Geoscience Education', based on two main teachers' professional development initiatives: an annual international workshop (GIFT – Geoscience Information For Teachers), running since 2000 in Vienna and elsewhere, and the EGU Geoscience

Education Field Officer (FO) programme, launched in 2019.

Six Geoscience Education Field Officers (four in Europe supported by EGU, and two in Morocco and India, supported by the International Union of Geological Sciences (IUGS) and by IGEO) were trained in 2019 and funded to give in-service and pre-service teacher training workshops in their respective countries. The target was stated as "Teachers of science or geography in schools and colleges who have some geoscience in the curricula they teach but who have poor geoscience backgrounds and have received no training in geoscience teaching". This description is likely to fit tens of thousands of teachers across Europe (EGU-CoE, 2019, p. 8).

EGU FO workshops are based on the methods and resources developed by ESEU – the Earth Science Education Unit, originally based at Keele University in the United Kingdom. They are targeted at the national curriculum of the relevant countries, are

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based on the constructivist approach and are interactive and hands-on.

Following the first year of activity of the EGU FO programme, its outcomes have been assessed through specific tools: FO periodic reports and teachers' questionnaires (Correia *et al.*, 2020).

The data collected are both quantitative and qualitative.

In this article we aim to explore the impact of the workshop on the participants, as perceived and expressed in their own words. In particular, we seek the optimisation of the EGU FO programme in the future. We are interested in understanding:

- what participants perceived about the workshops;
- what they appreciated in the workshops and the reasons for appreciation or complaint;
- what they needed from teacher training and expected from this kind of workshop.

**Materials and methods**

This study was performed as part of the assessment of the first year of activity of the EGU FO programme. The study sample was the participants in the professional development workshops run by EGU FOs between May 2019 and April 2020 in France, India, Italy, Portugal and Spain.

The attendants filled in a questionnaire asking:

- for demographic and professional data;
- three closed questions (5-point Likert scale) about participants' general interest in the workshop, professional interest in the workshop and interest in attending future workshop of the same type;
- two open questions asking for general comments on the workshop and suggestions for future workshops.

The questionnaires were anonymous and

did not contain any sensitive information. The participants were informed in advance about the purpose of the evaluating study, were asked for written consent to use their responses and were given an opt-out choice.

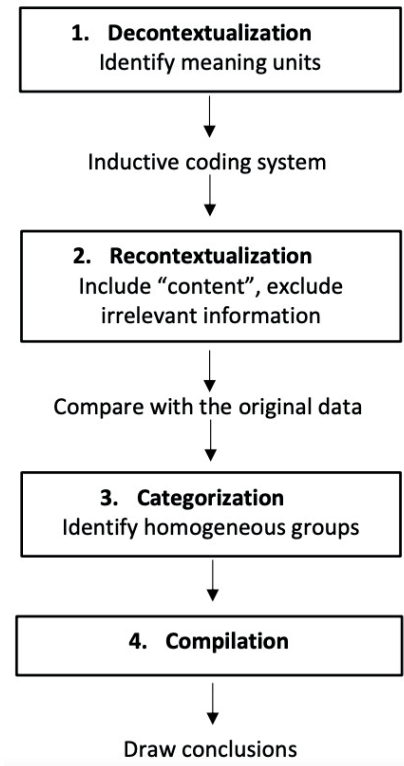
The present investigation is focused on the open answers, analysed by means of conventional inductive content analysis (Bengtsson, 2016). Content analysis allows "an interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" (Hsieh & Shannon, 2005, p. 1278). Our analysis is defined as conventional, because it is aimed at describing phenomena, and inductive, because it is not based on pre-conceived categories, allowing the categories to emerge from the data. The phases of the analysis are outlined in *Figure 1*.

Open answers in the questionnaires were first translated into English by the FOs and checked by national colleagues to ensure fidelity to the original texts. The analysis was performed adapting the methodology proposed by Haney *et al.* (1998, as cited in Stemler, 2001). First, two researchers independently repeatedly reviewed the answers and drafted a category checklist. Second, they compared their initial checklists and reconciled any differences. Then the researchers, together with a third researcher, used the consolidated checklist to independently code the answers. Finally, the coders met (online) and discussed the points where disagreements had emerged, reaching a consensual analysis, whose outcomes are detailed in the next section.

*Table 1* provides an example of the scheme of the analysis process from raw data to results.

**Results**

Since the start of the FO program 21 workshops have been run (*Figure 2*) and 12 more were planned before the outbreak of the COVID-19 pandemic and the adoption of lockdown measures in the FOs' countries,



*Figure 1: Flowchart: phases of the content analysis (adapted from Bengtsson, 2016).*

leading to the interruption of classroom activities and to the cancellation of all teacher events. The number of workshop participants was 379, of whom 296 completed the evaluation form and gave their consent for the use of the collected data.

Among the respondents, 82% were female, and teaching experience ranged between 1 and more than 40 years, with 53% of them in the 7-to-25-year band. Confirmed teachers accounted for 73%, hired (supply) teachers for 19% and trainee teachers for 6% of the sample.

The participants' school level was the secondary school for 74% and the primary school for 26% of the sample, with differences between countries: primary school teachers were 100% in France and 38% in Italy; secondary school teachers were 100%

*Table 1: Example of the coding process.*

Meaning unit	Condensed meaning unit	Code	Category
Perfect format: neither too long nor too short	perfect format	Satisfaction about the training	General appreciation for the course and the trainers
I learnt a lot about sciences, thanks	I learnt a lot	Learning opportunity	Impact on the attendant teacher
Highly valuable the practical approach of the proposals...	highly valuable the practical approach	Appreciation for the practical labs	Comments on the practical knowledge
... without omitting precise information	precise information	Appreciation for the provided information	Comments on the theoretical/pedagogical knowledge



Figure 2: Location of the workshops run between May 2019 and April 2020.

in India, Portugal and Spain, and 61% in Italy.

Most of the participants (81%) taught Natural Sciences/ Biology/Geology, followed by Physics/Chemistry (9%) and Geography (6%).

The topics addressed in the workshops were agreed with the organizers in accordance with national curricula. Ranked in order of occurrence in the countries, they were seismology (in all 5 countries), volcanism, plate tectonics, Earth structure and magnetism, fossils and geologic time, rock identification (in 4 countries) and rock cycle, outdoors Earth science (in 3 countries).

The outcome of the workshops was assessed as described above. Participants' quantitative evaluation of the workshop included general interest, professional interest and interest in attending other similar workshops. The results were very positive in the four European countries (no evaluation data was available from the Indian

sample): these three aspects of the training were rated at the highest level (5 out of 5) by respectively 84%, 81% and 81% of the respondents.

Open questions obtained 117 general comments on the participants' experience of the workshop and 59 suggestions for future workshops. General comments included answers ranging from very concise remarks to very detailed considerations addressing different issues. The process of content analysis on these texts led to the identification of six major categories of comments.

In order of frequency among the respondents, the categories identified were:

- comments on the practical knowledge provided by the workshop (53%),
- general appreciation for the course and for the trainers (51%),
- comments on the theoretical and/or pedagogical knowledge provided by

the workshop (28%) and

- comments on the workshop's impact on the participant (27%).

A minority of respondents made critical comments on the workshop (6%) or shared their considerations about geoscience teaching in general (4%).

Within these major categories we identified further trends worth presenting. In the category "general appreciation for the course and for the trainers" (Figure 3), in which about half of the respondents wrote positive comments, the organisation and methodology of the workshop were most appreciated, followed by the interest of the activities and their usefulness. The trainers' skills and the pleasure of participation were also praised.

Examples for this category are: "Perfect format: neither too long nor too short", "Clarity in presentation, friendliness and availability of trainers", "All the subjects covered were adequate and relevant. Topics were

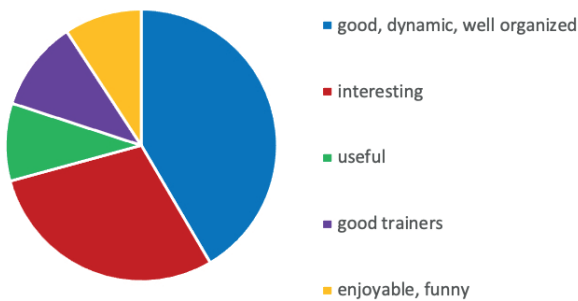


Figure 3: General appreciation of the workshop: sub-categories proportion.

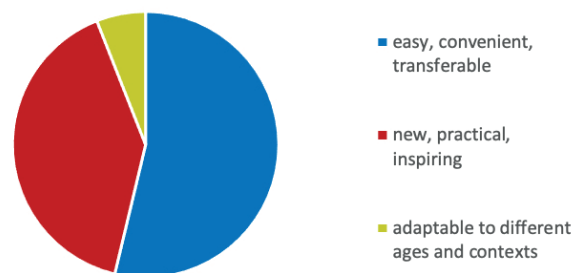


Figure 4: Comments on the practical knowledge: sub-categories proportion.

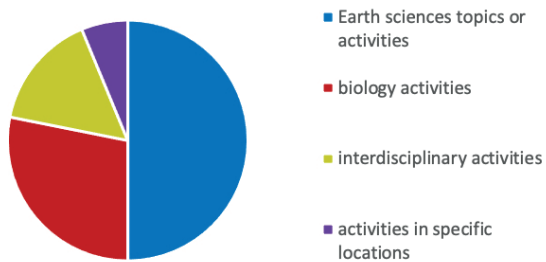


Figure 5: Specific requests for future workshop topics and subjects: proportion of sub-categories.

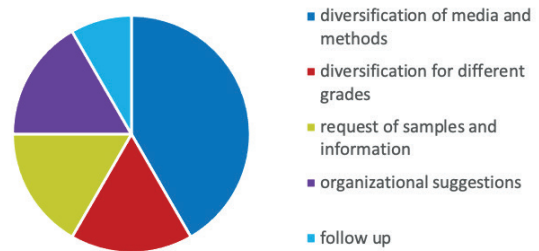


Figure 6: Methodological or organizational suggestions: proportion of sub-categories.

presented in a diverse, dynamic, rigorous and very pleasant way”.

The category where the most answers were collected was “comments on the practical knowledge” provided by the workshop (Figure 4): more than half of the respondents commented on this point. In this category the most appreciated aspect of the training was the ease and transferability of hands-on activities (54% of the concepts in this sub-category), followed by the novelty, relevance and inspiration for use in the classroom (40% of the concepts in this sub-category). Finally, some teachers also praised the adaptability of the proposed activities to different age groups.

Comments of this category include example like these: “Affordable activities. Easily implemented. interesting materials and tools”, “Activities that integrate the programs of the curricular areas, activities to be developed at different levels”, “Funny to be performed in the classes. Effective kinaesthetic experiences”.

Most comments on the theoretical and/or pedagogical knowledge evidenced participants’ appreciation for the ideas, methods and knowledge achieved through the workshop, while others highlighted the motivational value of the activities for the students. Within the comments about the impact on the participants, many addressed the enrichment and significant learning opportunities, as well as the motivation and inspiration provided by the workshop. One teacher wrote “I observed the rocks with other eyes”, another “You make people love Geology”. Critical comments were few, and most of them complained about the time constraint, asking for longer workshops in order to carry out the activities with less pressure.

The second open question elicited suggestions for future workshops. In order of frequency among the responders, the identified categories were:

- specific requests about topics and subjects (51% of respondents),
- suggestions for more or longer training sessions like this (22%),
- methodological or organizational suggestions (20%),
- no suggestions (or general approval of the workshop, 19%),
- remarks on existing difficulties (3%).

In this category, too, different trends were further identified as sub-categories.

Most of the teachers’ requests (Figure 5) addressed training on specific topics and activities within geology (rock recognition, geological charts, Earth history) and Earth sciences in general (atmosphere, global warming). Some of the attendees expressed interest in interdisciplinary activities or in activities in particular locations. Surprisingly, 30% of the requests were related to training and activities for biology teaching, which are not addressed by the geoscience-specific Field Officers.

Another interesting sub-category which emerged from the requests addressed organisation and methodology (Figure 6): some teachers proposed the use of media for dissemination, videos, field trips and practical labs.

Some suggestions concerned the diversification of activities for different school grades, others the need for samples (rocks) or references for materials providers. Some teachers also suggested running the workshops at the beginning of the school year or that they should be given a day’s leave to attend the workshop. One comment suggested including a follow-up to check what use teachers have made of the information, activities and strategies covered by the workshop.

Most of the remaining suggestions asked for more training or longer workshops, or simply approved of the workshop they had attended: “Go on with the dissemina-

tion of this methodology”. Two suggestions addressed existing difficulties, due to the date of the workshop in the middle of the school year or to the constraints of the Spanish science syllabus.

### Discussion

The analysis of workshop participant comments and suggestions in their questionnaire responses provided several elements inevitably absent from closed answers. However, it is notable that the responses to the closed questions were supported by those to the open questions and vice versa.

We found that the high level of appreciation for the general interest and the professional interest of the workshops given by the quantitative data was confirmed by “triangulation” with the high number of positive comments, especially in the categories “comments on the practical knowledge” (53%) and “general appreciation for the course and the trainers”(51%). Even taking into account a possible tendency to want to please the trainers, the appreciation expressed in the closed questions was strongly supported by the open-question responses.

Participants’ critical remarks emerged in only 6% of the comments, and in more than half of the cases they expressed the need for more time or a deepening of the topics, as confirmed by the corresponding requests in the suggestion answers.

In comparison with the other studies on this kind of workshop performed in the United Kingdom with the use of a similar questionnaire (King & Thomas, 2012), our research yields higher mean scores in teachers’ appreciation. A possible explanation could be the fact that in the countries of our sample the availability of these workshops is a novelty, while in the United Kingdom they have been run in large numbers across the country since 1999. It may also be because

the majority of participants in the UK were trainee teachers, whilst the majority of participants in these workshops were practising teachers.

The recent UNESCO report on earth science education across the globe (UNESCO, 2019) found that the availability of teacher training courses in geosciences areas ranged between 33% (for primary and upper secondary schools) and 42% (for lower secondary schools) over 12 European countries, including the FOs' countries, evidencing the general need for professional development as a possible reason for the high appreciation found in our sample.

Also, the "suggestions for future workshops" confirm the data of the closed answers on the interest of the participants in attending future EGU FO training events. Teachers appear willing to attend this kind of professional development and gave evidence of their motivation by making specific and diverse proposals about workshops on geosciences and beyond. The suggestions about providing more/longer workshops or simply continuing this way (41%) further support this finding.

## Conclusions

The results of this study, performed on a medium-sized international teacher sample, allow the drawing of some conclusions and recommendations:

- The outcome of EGU FO workshops, assessed as reactions of the participants expressed in their own words, appears very positive as a whole and in detail.
- EGU FO workshops seem to be valuable in filling the gap in the professional development support available to geoscience teachers across Europe and beyond.
- The EGU FO workshops can contribute to the improvement of geoscience education at school through the multiplying effect of teachers on large numbers of students.
- It would be advisable to monitor the real impact of EGU FO workshops on geoscience teaching through a follow-

up involving the teachers attending the workshops, through later questionnaires and interviews.

- Finally, we ought to keep in mind that good quality geoscience education for all is a keystone for achieving UN Agenda 2030 Sustainable Development Goals, and is equally important in meeting the targets of the Sendai framework for Disaster Risk Reduction (2015-2030).

## Acknowledgements

Authors are grateful to the EGU and IUGS for funding the program. They also thank the EGU Committee on Education (CoE) and the IUGS Commission on Geoscience Education (COGE) for their strategic overview and support, and the FOs' supporters, whose collaboration was crucial to the success of the initiative.

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