



**Strategy for Enhancing Global Geoscience Education – 2019**



# Strategy for Enhancing Global Geoscience Education – 2019

## The International Union of Geological Sciences Commission on Geoscience Education (IUGS-COGE)

### Summary

#### Objectives and structure, products, accomplishments and budget of IUGS-COGE

These are presented as Appendices 1-3 and 7-8 to this document.

#### Background to the development of this ‘*Strategy for Enhancing Global Geoscience Education – 2019*’ document

This report builds on the European Geosciences Union (EGU) ‘*Strategy for Enhancing Geoscience Education – 2018*’ document approved and fully funded by EGU Council for 2019, with indicative budgets to 2023 acknowledged.

This report includes funding requests to the IUGS Executive Committee for the support of the International Union of Geological Sciences Commission on Geoscience Education (IUGS-COGE) Chair to attend the 2020 and succeeding IUGS Executive Committee meetings (**Priority 1**) the International Geological Congress in New Delhi in March 2020 (**Priority 2 – 2020/21**) and the educational component of the postponed GeoSoc conference in Bangladesh in 2019 and the educational component of one other conference annually (**Priority 6**).

Note: Priorities for 2019/20 are shown in black, those for 2020/21 in red, those for 2021/22 in blue and those for 2022.23 in green.

#### The global school-level geoscience education scene

Global surveys of surveys of geoscience education, the latest in 2017/18, have shown variability and great scope for improvement in many countries. In particular they show that around a third of countries do not have geoscience in their school curriculum; for those countries that do, many schools do not follow curriculum guidelines relating to geoscience, teachers of geoscience are not well supported, and the textbooks and teaching materials they rely on are of only moderate or poor quality.

#### Targeting geoscience educators

Research has shown that the most effective way to improve geoscience education is to target teachers and other educators. Research has also shown that providing good teaching materials is not enough on its own – educators need to be shown how to use the materials most effectively.

#### Geoscience educator groups

Experience indicates that geoscience educators can be sub-divided into five main groups:

1. teachers of geoscience in schools and colleges with strong geoscience backgrounds;
2. teachers of science or geography with some geoscience in their teaching, who have weak geoscience backgrounds;
3. teachers of geoscience in Higher Education;
4. providers of informal geoscience education;
5. researchers into geoscience education.

#### Plans for the future in support of these groups

Having discussed the backgrounds and currently available support for each of these groups, this strategy document concludes that the following plans will be most effective in supporting these groups in the future.

1. **Teachers of geoscience in schools and colleges with strong geoscience backgrounds** The IUGS should:
  - continue to support the International Geoscience Education Organisation (IGEO) and its regional chapters (South American and European chapters) in the work of supporting global geoscience education, by continuing to provide financial support for the IGEO and by publicising its initiatives.
  - publicise GIFT teacher conferences which attract teachers from across the globe.
  
2. **Teachers of science or geography with some geoscience in their teaching, who have weak geoscience backgrounds** The IUGS should:
  - continue its publicity support for the Earthlearningidea website initiative with its increasing numbers of teaching activities and its global importance (4 million downloads so far); as the initiative uses voluntary effort, it requires no funding.
  - in view of the IUGS investment in funding the re-drawing of diagrams for the international textbook, '*Exploring Geoscience – across the globe*', the IUGS should continue to support this textbook initiative and the development of its regionalised versions, through publicity.
  - extend the Geoscience Education Field Officer programme (formulated as a pilot programme for field officers in four countries by the EGU), by developing a parallel pilot programme to appoint and train four field officers in non-European countries where their efforts are likely to be successful. These IUGS/IGEO Geoscience Education Field Officers would be trained in offering interactive workshops to teachers and other educators through methods that research has proved to be effective. They would then offer these workshops at teacher conferences and other venues. IUGS support for this global pilot initiative would provide funding for them to travel to Vienna in April 2019 for training (**Priority 3**), would fund the local purchase of workshop apparatus and materials (**Priority 4**) and their attendance at national teacher conferences (**Priority 5**). If the global pilot is successful, the IUGS should acknowledge indicative budgets until 2022/23 to continue to support the first four field officers in future years, whilst appointing four more Field Officers for 2020/21 (**Priorities 7, 8 and 9**), for 2021/22 (**Priorities 10, 11 and 12**) and for 2022/23 (**Priorities 13, 14 and 15**).
  
3. **Teachers of geoscience in Higher Education** The IUGS should:
  - keep in view the developing strategies of the EGU Committee on Education (EGU CoE) to provide subject-specific professional development in teaching to geoscientists in Higher Education, with a view to supporting these initiatives through approval and publicity in the future.
  
4. **Providers of informal geoscience education** The IUGS should:
  - a) **for those providing geoscience outreach – who have first degrees in geoscience.**
    - continue to support the range of initiatives in place – through providing publicity.
  - b) **for those providing geoscience outreach – who have poor geoscience backgrounds**
    - financially support the global IUGS/IGEO Geoscience Education Field Officer initiative described above, to enable the Field Officers to offer training packages to informal educators, with training being funded by their host institutions.
  
5. **Researchers into geoscience education** The IUGS should:
  - if the EGU develops a database of geoscience educational researchers to facilitate networking between them – provide publicity support for this initiative.

#### **IUGS-COGE in the future**

The commission has developed a job description for Commission members, Appendix 6.

#### **Conclusion**

The IUGS Executive Committee is urged to support the work of the IUGS Commission on Education in general and the Geoscience Education Field Officer initiative in particular.

# Strategy for Enhancing Global Geoscience Education – 2019

## The International Union of Geological Sciences Commission on Geoscience Education (IUGS-COGE)

### Objectives and structure and products and accomplishments of IUGS-COGE

The overall objectives of IUGS-COGE remain the same as indicated in previous reports, such as the 2016 report, as indicated in Appendix 1. The IUGS-COGE objectives relate to the scientific objectives of IUGS, as also recorded in the IUGS-COGE 2016 report and included in Appendix 1. IUGS-COGE focusses particularly on the IUGS objective of: *'strengthen public awareness of geology and advance geological education in the widest sense.'*

The current structure and organisation of IUGS-COGE can be found in Appendix 2. The chief products and accomplishments of IUGS-COGE during 2018 are listed in Appendix 3. Details of the 2017/18 budget are given in Appendix 7. The 2019 budget request, with indicative budget requests until 2022/23 are given in Appendix 8.

### Background to the development of this *'Strategy for Enhancing Global Geoscience Education – 2019'* document

In the Autumn of 2018, the Chair of IUGS-COGE was also appointed as Chair of the European Geosciences Union Committee on Education (EGU CoE). Chris was invited by the EGU hierarchy to devise a new strategy for supporting geoscience education across Europe and beyond. A strategy document was developed as *'Strategy for Enhancing Geoscience Education – 2018'* and the summary of that document is attached as Appendix 4. A budget request was appended to the document, including a funding request for 2019 and indicative funding requests from 2020 – 2023.

At the EGU Council meeting in October 2018, the document was approved by the Council, the budget request for 2019 was also fully approved and the indicative budgets for later years acknowledged. Since then implementation of the strategies detailed in the document began, and by December 2018, good progress had been made.

In October 2018 IUGS Commissions were asked to provide much more detail than previously for their budget bids to be submitted in early 2019. This seemed like an opportune time to devise a global strategy for supporting geoscience education. This view was supported by members of the Commission on Geoscience Education (COGE) and so that is the subject of this document.

This document builds on the foundation of the previous EGU *'Strategy for Enhancing Geoscience Education – 2018'* document in a global context and draws on previous activity of IUGS-COGE, the International Geoscience Education Organisation (IGEO) and surveys of global geoscience education carried out previously by IGEO with the support of IUGS and, most recently, carried out by UNESCO/IGEO with the support of IUGS.

The document also supports of the work of the IUGS-COGE Chair to:

- attend the 74<sup>th</sup> IUGS Executive Committee meeting in 2020 (assumed to be in Europe for costing purposes) and in future years (**Priority 1**);
- attend the International Geological Congress in New Delhi in March 2020 (**Priority 2 – 2020/21**)
- support the educational component of the postponed Geoscience for Society (GeoSoc) conference in Bangladesh (postponed from 14-17 March 2019) and the educational component of one other conference annually (**Priority 6**).

### **The global school-level geoscience education scene**

The results of the third international survey of geoscience education were published in *Episodes* in 2013. The report concluded: 'Overall, the data indicates that most global developments in Earth science education at school level have been driven by enthusiastic individuals and groups. This being the case, it is not surprising that global development is very patchy. Nevertheless, a general improvement is probably discernible.' (King, 2013, 26).

In 2017/18 a fourth survey was undertaken by UNESCO/IUGS with IUGS support. The survey gathered electronic questionnaire information from experts in most Latin American and Caribbean countries. In addition to this, through IGEO and IUGS contacts, information was collected from a further 37 countries beyond South America. The two reports, one on South and Central America and the second on the global findings beyond South and Central America will be published in the Spring of 2019. Although the full findings are not yet published, a preview of the global data beyond South and Central America was presented at the IGEO international geoscience education conference, GeoSciEd VIII in Brazil in July 2018. This preview concluded as follows:

'... the current situation does appear to be poorer than previously, and can be summarised as ...: 'that the Earth science coverage of curricula across the world is variable, with significant numbers of countries having no reported Earth science curriculum; for those countries that do have Earth science curriculum guidance, the guidance is not closely followed in a significant number of countries.

In conclusion, therefore, the state of Earth science education across the world shows scope for major improvement in a number of areas and regions. By raising awareness of these issues through this survey, it is hoped that more emphasis on, and support for, Earth science education across the world can be provided in the future, by all agencies concerned.' (King, 2018, 135).

The 2017/18 survey preview (King, 2018) also showed:

- only around two thirds of the countries surveyed have geoscience in their curriculum
- the geoscience teaching guidelines are not closely followed in around a third of countries
- support for geoscience teachers in schools is available in less than half the countries whilst financial support is available in less than a quarter of the countries
- in the majority of the countries the quality of teaching materials is moderate or poor

The final point is particularly concerning because research has shown that school teachers are highly dependent on textbooks (e.g. Good, 1993, Abraham et al, 1992, Ball and Cohen 1996), whilst surveys of the geoscience content of school textbooks shows that they are generally inaccurate and poor (Stern & Ahlgren, 2002; Kesidou and Roseman, 2002; Stern and Roseman, 2002; King, 2010; King 2013).

The e-book published in late 2018 edited by Greco and Almborg entitled '*Earth science education; global perspectives*' (with the support of IUGS-COGE and IGEO) emphasises the variability of Earth science education across nations (Greco & Almborg, 2018).

### **Targeting geoscience educators**

Research has shown that the most effective way to improve geoscience education is to target teachers and other educators. For example, research in the UK showed that secondary school teachers trained in geoscience teaching, taught a mean of 393 pupils per year (King & Thomas, 2012); thus, over several years of teaching, each teacher impacted thousands of pupils. Similar arguments apply to geoscience lecturers in Higher Education (who each impact upon several tens of undergraduates per year) and to those involved in geoscience outreach, who each teach hundreds of adults and families each year.

Research has also shown that, whilst it is important for geoscience educators to have good teaching materials, providing good materials alone is not enough. Good teaching materials need to be put into the hands of the educators and they need to be shown how to use them if there is to be measurable impact

on teaching and learning (Adey, 2004; Cordingley et al 2005 a, b; Guskey, 2000; Lydon & King, 2009, Muijs et al, 2004).

### **Geoscience educator groups**

Experience indicates that geoscience educators can be sub-divided into five main groups. These were the groups recognised in the EGU *'Strategy for Enhancing Geoscience Education – 2018'* document, as follows.

1. Teachers of geoscience in schools and colleges who have strong geoscience backgrounds and who may also have received training in geoscience education.
2. 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.
3. Teachers of geoscience in Higher Education (HE) who have strong geoscience backgrounds and have received generic training in HE teaching, but who have usually received little professional development in geoscience education.
4. Those providing informal geoscience education.
5. Researchers into geoscience education.

[A sixth group may be those who offer training to geoscience technicians, but there is little data available on this group, if it exists.]

Much of the remainder of this document has been structured according to these five groups.

### **1. Teachers of geoscience in schools and colleges who have strong geoscience backgrounds and who may also have received training in geoscience education**

#### **Background of this group**

These are usually teachers of geoscience in schools and colleges to students of age 16 and older. They usually have first degrees in geoscience and have received training in geoscience education. The group includes:

- A-level geology teachers in the UK;
- geoscience-trained school teachers of natural sciences in southern Europe;
- some geoscience-trained geography teachers in northern Europe;
- college teachers of geoscience in the USA;
- school teachers of Earth science in Japan, South Korea, the Philippines and Taiwan.

There may be several thousands of these geoscience teachers across the world. All teachers, including this group, need professional development and support.

#### **Currently available support for this group**

- The International Geoscience Education Organisation (IGEO) with its quadrennial GeoSciEd international conference and its support for the education strand of the quadrennial International Geological Congress (IGC) – both of these supported by IUGS.
- Chapters of the IGEO – the only existing chapter is the new South American chapter, a European chapter is in the planning stage.
- National organisations including:
  - Canadian Geoscience Education Network (CGEN) in Canada;
  - Association des Professeurs de Biologie et de Géologie (association for Earth Science teachers – APBG) in France;
  - Earth science section of the Associazione Nazionale Insegnanti di Scienze Naturali (National Association of Natural Sciences Teachers - ANISN) in Italy;
  - Associação Portuguesa de Professores de Biologia e Geologia – (association for Earth science teachers – APPBG) in Portugal;
  - Asociación Española para la Enseñanza de las Ciencias de la Tierra (association for the teaching of Earth sciences - AEPECT) in Spain;
  - Earth Science Teachers' Association (ESTA) in the UK;

- National Association of Geoscience Teachers (NAGT) and the National Earth Science Teachers' Association (NESTA) in the USA.
- Both the EGU and the AGU (American Geophysical Union) run regular GIFT workshops for teachers (EGU = Geoscience Information for Teachers; AGU = Geophysics Information for Teachers).

### **Plans for the future in support of this group**

- A meeting to develop an IGEO/EGU European chapter is planned for April 2019 at Coimbra, Portugal to bring European national groups together into an umbrella organisation. This first meeting is financially supported by EGU.
- GIFT conferences are being planned for Vienna (annually, EGU), Montreal 2019 (AGU), Central America (EGU 2020 – 2023) and southern Africa (EGU 2021 – 2024).
- The IUGS should support all these initiatives by continuing to support the work of IGEO financially and by publicising the initiatives.

## **2. 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**

### **Background of this group**

These are usually secondary (high school) teachers of science or geography or primary (elementary) teachers who have some geoscience in their teaching curriculum, but who have received little or no training in geoscience or in geoscience education. There may be many tens of thousands of these teachers across the world.

Poor teaching by this group, widely reported anecdotally, leads to uninspired teaching and the promulgation of misconceptions amongst pupils – giving geoscience a bad name and making pupils less likely to choose a future career in geosciences. This poor teaching is often exacerbated by the lack of availability or the poor quality and inaccurate Earth science content of many science, geography and primary textbooks.

### **Currently available support for this group**

- The Earthlearningidea website, which was originally developed for the International Year of Planet Earth (IYPE) in 2008, and currently publishes a new geoscience teaching idea every two weeks, now carries more than 300 activities in English and nearly 1000 translations into 12 other languages. There have been more than 4 million downloads of these activities globally, averaging more than 45,000 per month.
- The international textbook supporting the International Geoscience Syllabus for 16 year olds (<http://www.igeoscienced.org/activities/international-geoscience-syllabus/>). The international version of the textbook '*Exploring Geoscience – across the globe*', was produced by voluntary effort, but the re-drawing of the diagrams was supported by IUGS funding.
- The work of the Earth Science Education Unit (ESEU) across the UK. Over the past 18 years, through oil industry funding:
  - the ESEU has trained nearly 40,000 practising and trainee science, geography and primary teachers;
  - workshops have been presented to these teachers by a network of presenters across the UK;
  - each workshop has been directly targeted at the curriculum, has been interactive, hands-on and designed to develop thinking and investigational skills in pupils, through carefully chosen, integrated and well-explained activities;
  - each teacher received one or more ESEU workshops; each workshop was usually of 90 minutes duration;
  - evaluation feedback 'on the day' was routinely excellent;
  - research carried out in 2003/4 and 2007/8 a year after an ESEU visit, showed that nearly all the schools visited (32% return rate) had changed their Schemes of Work and therefore their teaching in the light of the workshop experience;

- through the survey, the teachers reported marked improvements in confidence, subject knowledge, good ideas, and intentions to increase the amount of practical work in their geoscience teaching (King & Thomas, 2012)
- ESEU-style workshops have been presented at venues across the world, including: Australia, Austria, Brazil, Canada, Germany, Hong Kong and Macau, India, Japan, Morocco, New Zealand, Nigeria, Philippines, Portugal, Russia, South Africa, Spain, Taiwan and the USA.

The work of the ESEU is continuing through visits to teacher training institutions despite greatly diminished oil industry funding. Currently ESEU facilitators are paid £250 (US\$320, €280) per visit and receive travelling expenses from the institution visited. ESEU also provides series of workshops annually at conferences of science teachers and of geography teachers, with continuing excellent 'on the day' feedback.

ESEU experience has shown that the most prolific and successful presenters were those on a career-break or who were recently retired, since they generally seemed to be those who had the most flexibility, enthusiasm and experience.

- Many other organisations around the world provide general geoscience support for teachers, but are not specifically teacher-focused organisations. Nevertheless, their support is very important and very much valued. These organisations include national geoscience societies (such as the Geological Society of America), national geological surveys (such as the Geological Survey of Bangladesh), museums (such as the Natural History Museum in Vienna, Austria), world heritage sites, (such as the Cradle of Humankind in South Africa) and geoparks (as listed on the UNESCO website).

#### **Plans for the future in support of this group**

- The Earthlearningidea website will continue on its voluntary basis – some thirty activities are in the pipeline, augmented by activities written by colleagues from overseas.
- Colleagues in IGEO have offered to develop regional versions of the *Exploring Geoscience* textbook, for publication and free download from the IGEO website
- The EGU Committee on Education (CoE) is developing a pilot programme in 2019/20 to appoint Geoscience Education Field Officers in four European countries to offer ESEU-style workshops to teachers at conferences of science, geography and primary teachers in their countries. These four Field Officers will be trained in Vienna in April 2019. Funding for their training in Vienna, their workshop equipment and the travelling expenses/registration fees for the national conferences they attend will be provided by EGU.

IUGS-COGE and IGEO jointly want to extend this offer to four Field Officers from non-European countries where their efforts are likely to be successful. Field Officers appointed in the Spring of 2019 can be trained alongside the EGU Field Officers in Vienna in April. The funding necessary to take this IUGS-COGE/IGEO initiative forward for 2019/20 is detailed in Appendix 8, with indicative budgets until 2022/23. The budget includes funding for the training of the Field Officers in Vienna in 2019 (**Priority 3**), funding for workshop kits of apparatus and materials for the Field Officers (**Priority 4**) and funding for them to attend national teacher conferences (travel and registration costs)(**Priority 5**). The 'Call' to be put out for these Field Officers is given in Appendix 5. If the 2019/20 pilot is successful, then IUGS-COGE and IGEO jointly would like to appoint four more Field Officers in 2020/21 (**Priorities 7, 8 and 9 for 2020/21**), an additional four in 2021/22 (**Priorities 10, 11 and 12 for 2022/23**) and another four in 2022/23 (**Priorities 13, 14 and 15 for 2022/23**). All these developments are included in the indicative budgets for 2021 – 2023 in Appendix 8.

If appointed, IUGS/IGEO Geoscience Education Field Officers could also offer training to people involved in informal geoscience education (as outlined in Section 4. below), particularly those in geoparks and aspiring geoparks and in the museum sector and similar institutions. In these circumstances it is anticipated that the training would be funded by the institutions involved.

### **3. Teachers of geoscience in Higher Education (HE) who have strong geoscience backgrounds and have received generic training in HE teaching, but who have usually received little professional development in geoscience education**

#### **Background of this group**

These people work in geoscience departments and in some geography and Environmental science departments teaching undergraduates. They usually have first and higher degrees in geoscience and have received generic educational training in their institutions but no geoscience-specific training. Some are lecturers and some are developing the skills to become lecturers. There may be thousands of these across the world.

#### **Currently available support for this group**

Anecdotal evidence suggests that there is very little subject-specific professional development available for this group, certainly in Europe. In the UK, the Higher Education Academy (HEA) runs a section entitled 'Geography Earth and Environmental Sciences' (GEES) that used to offer support for teaching by Higher Education geoscientists. However, the funding for this was cut, and only a website seems to survive (<https://www.heacademy.ac.uk/discipline/geography-earth-and-environmental-sciences-gees>). An offshoot of GEES in the UK is the Higher Education Network (HEN) which runs a small annual conference. IUGS-COGE is not aware of any other organisation worldwide offering specific teaching support to HE geoscientists.

#### **Plans for the future in support of this group**

The best people to identify and spread good practice and innovative ideas in geoscience teaching, lecturing and fieldwork in Higher Education are those involved in this aspect of teaching day by day. For this reason, the EGU has appointed two new members to its Committee on Education from Higher Education to take this agenda forward.

As of January 2019, this group had not yet met but research into the current system was being undertaken and a strategy for the support of HE geoscientists was being developed. This is focussed primarily on early career geoscientists, but also targets more senior staff who have responsibility for coordinating teaching.

### **4. Those providing informal geoscience education**

#### **Background of this group**

These people offer geoscience outreach, such as through geoparks, outreach in national and regional parks, museum geoscience education, HE outreach, industry/mining outreach, adult geoscience courses and field trips; these have varying backgrounds but most have not been trained in geoscience education.

They fall into two main groups, a) those who have first degrees in geoscience and b) those who have poor geoscience backgrounds. Usually neither group has received training in geoscience education although most have high levels of enthusiasm. There may be tens of thousands of these geoscience outreach educators across the world.

#### **Currently available support for this group**

##### **c) Those providing geoscience outreach – who have first degrees in geoscience.**

The EGU reports that it runs an extensive outreach programme, coordinated by the EGU Outreach Committee and described at: <https://www.egu.eu/outreach/>. This Committee convenes sessions on outreach at the EGU General Assembly in Vienna each March/April. The EGU has also recently begun publication of a journal entitled 'Geoscience Communication'. At its General Assembly, the EGU offers training workshops to General Assembly participants in geoscience communication.

The quadrennial International Geological Congresses (IGCs) include sessions on geoscience outreach in their programmes, for example, the symposium planned for the 36<sup>th</sup> IGC in Delhi in 2020 on 'Geoscience

communication and outreach' and other symposia with related titles. Elements of geoscience outreach are generally also covered by the quadrennial IGEO international GeoSciEd conferences.

#### **d) Those providing geoscience outreach – who have poor geoscience backgrounds**

There appears to be little training available for this group. The Earth Science Teachers' Association (ESTA) in the UK is currently devising and testing a training package for those involved in geoparks and aspiring geoparks. ESTA is also exploring how best to support museum curators and educators in providing geoscience education.

#### **Plans for the future in support of this group**

If it becomes possible to appoint IUGS/IGEO Geoscience Education Field Officers, these will be trained in offering a training package to those in geoparks and aspiring geoparks. It is anticipated that funding for presenting these training packages will be provided by the geoparks themselves.

If, in the future, ESTA is able to develop training packages for museum curators and educators to provide geoscience education, IUGS/IGEO Field Officers can be trained in presenting this package in future years.

### **5. Researchers into geoscience education**

#### **Background of this group**

There are strong communities of geoscience educational researchers in some countries such as the USA, Brazil and Israel, however geoscience educational researchers are not common in many other countries.

#### **Currently available support for this group**

Sessions in which geoscience educators can present their research form part of the annual Geological Society of America (GSA) conferences in the USA. Their research can also be presented at the quadrennial International Geological Congresses (IGCs) and the quadrennial IGEO international GeoSciEd conferences. However, there are not strong geoscience educational research sessions at either of these quadrennial international conferences.

The National Association of Geoscience Teachers (NAGT) in the USA publishes a high-profile journal, the '*Journal of Geoscience Education*' which carries mainly US submissions, but also some international papers.

#### **Plans for the future in support of this group**

The EGU is investigating the possibility of setting up a database of geoscience educational researchers. If this becomes possible, then this will build contact between geoscience educational researchers worldwide.

#### **IUGS-COGE in the future**

In order to support and consolidate these developments in the future, the Commission has developed a 'job description' for Commission members. This job description is included as Appendix 6.

#### **Conclusion**

This '*Strategy for Enhancing Global Geoscience Education – 2019*' document addresses the IUGS objective of to: '*strengthen public awareness of geology and advance geological education in the widest sense.*'

The document has not only identified real weakness areas in geoscience education around the world, but some important pockets of strength and innovation.

The most important ways of providing IUGS support for global geoscience education are by:

- supporting and collaborating with global geoscience educational initiatives already underway – a number of these have been outlined in the document above;

- in particular, by broadening the EGU pilot initiative to appoint and train unpaid Geoscience Education Field Officers in different countries; as part of an IUGS/IGEO extension to the EGU pilot, four Field Officers would be appointed and trained in presenting interactive workshops to teachers and informal educators in their own regions during 2019/2020.

If the Geoscience Education Field officer pilot is successful, and it is to be rolled out to more countries beyond the four included in the pilot, then this will involve considerable IUGS investment in future years. However, no other initiatives seem to have the capacity to, '*strengthen public awareness of geology and advance geological education in the widest sense*', given that research has shown that the most effective way to promote geoscience educational reform is to put effective teaching materials in the hands of teachers and educators and to demonstrate how these can be used most effectively.

Thus the IUGS Executive Committee is urged to support the work of the IUGS Commission on Education in general and the Geoscience Education Field Officer initiative in particular.

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## **Appendix 1. The overall objectives of IUGS-COGE, as given in the 2016 report to IUGS Council**

### **Overall objectives**

The IUGS Commission on Geoscience Education, Training and Technology Transfer (COGE) was established in 2004 to examine and develop programs to assist developed and developing countries to maintain, expand or introduce better Earth Science education, outreach and technology transfer within their countries.

The main objectives defined and approved by the IUGS are:

- Identify gaps in education, training and technology transfer both conceptually and geographically.
- Together with other relevant bodies in or outside the IUGS family, develop strategies for the coordination of existing, and the development of new, programmes in geoscience education, training and technology transfer based on the identified gaps.
- Produce a 5-year Action Plan together with an annual plan of action including budget.
- Organise meetings, conferences and workshops for geoscience educators and to disseminate information on new trends and topics in the field of geosciences.
- Develop specific programmes on the continuation and coordination of training courses, especially through generation of teaching materials and provision of training courses.
- Encourage publication of handbooks or textbooks at an international level to help bridge recognised gaps in the training of, and education for, geoscientists.
- Facilitate the harmonisation of geoscience presentation with different cultures in order to enhance the development of ethics in geoscience education.
- Assist in the distribution of geoscience teaching materials, including books, videos, equipment, etc.

### **Relate goals to overall IUGS scientific objectives**

The IUGS aims to promote development of the Earth sciences through the support of broad-based scientific studies relevant to the entire Earth system; to apply the results of these and other studies to preserving Earth's natural environment, using all natural resources wisely and improving the prosperity of nations and the quality of human life; and to strengthen public awareness of geology and advance geological education in the widest sense. The scientific work of the IUGS is carried out primarily by Commissions, Task Groups, Initiatives, and Joint Programs.

The IUGS-Commission on Geoscience Education Training and Technology Transfer (IUGS-COGE) is the key tool of IUGS for developing geoeducational activities. The main goals of the commission follow the IUGS scientific guidelines, in accordance with its main role for fostering geoscience education and developing geoscience education and awareness for the benefit of society.

## **Appendix 2. The current structure and organisation of IUGS-COGE.**

### **IUGS-COGE Commissioners**

- Chris King, *Chair*, Keele University – United Kingdom
- Ian Clark, *Secretary/Treasurer*, University of South Australia – Australia
- Greg McNamara, *Webmaster*, Geological Society of Australia – Australia
- Jesús Martínez-Frías, *Former Chair*, Spanish National Research Council, CSIC –Spain
- Gary Lewis, *Former Chair and IUGS Strategic Planning Committee* – USA
- Ochir Gerel, *Former IUGS Vice President and IUGS Strategic Planning Committee* Mongolian University of Science & Technology – Mongolia
- Adriana Niz, University of Catamarca – Argentina
- Yamina Bourgeoini, Cadi Ayyad University – Morocco
- Elyvin Nkhonjera, Community Economic Improvement Project, YES – Malawi
- R. Shankar, Mangalore University – India
- Miguel Cano, Bicol University– Philippines
- Ashvin Wickramasooriya, South Eastern University of Sri Lanka – Sri Lanka
- Jaroslav Dostal, Saint Mary's University in Halifax – Canada
- Young-Shin Park, Chosun University – South Korea
- Lola Pereira, Universidad de Salamanca – Spain
- Roberto Greco, University of Campinas – Brazil
- Clara Vasconcelos, University of Porto – Portugal

### **Appendix 3. The products, accomplishments and interactions of IUGS-COGE during 2018.**

#### **Interactions of IUGS-COGE with international and national organisations**

During 2017/18 IUGS-COGE has had fruitful interactions with the following organisations.

1. The **Resources for Future Generations (RFG)** conference committee, devising, supporting and contributing to the geoscience education strand, June 2018.
2. The **International Geoscience Education Organisation (IGEO)** contributing sessions and a keynote speech to the international GeoSciEd VIII conference in Brazil, July 2018.
3. The **Arabian Geosciences Union (ArabGU)**, the **African Association of Women in Geosciences (AAWG)** and the **African Geoparks Network (AGN)**, supporting the educational strand of the First International Conference on Geosciences, Morocco, 2018.
4. The **UNESCO International Geoscience and Geoparks Programme, Regional Office for Science in Latin America and the Caribbean (UNESCO Montevideo)** in conducting an international survey of geoscience education to be published in Spring 2019 (two reports, one on 35 non-Latin American countries, the other on most Latin American countries).
5. The **European Geosciences Union (EGU)** through providing expertise to its development of its, 'Strategy for Enhancing Geoscience Education – 2018' document.
6. The **Association of Geoscientists for International Development (AGID)** and the **South Asian Association of Women Geoscientists (SAAWG)** in planning the educational strand of the Geoscience for Society conference, Bangladesh, March 2019.
7. The **International Union of Geodesy and Geophysics (IUGG)** through discussions to support their **American Geophysical Union (AGU)** GIFT Conference planned for Montreal in July 2019.
8. Supporting the work of IGEO/EGU in developing a European Chapter of IGEO, by initiating contact with:
  - **Association des Professeurs de Biologie et de Géologie** (French association for Earth Science teachers – APBG) in France
  - **Associação Portuguesa de Professores de Biologia e Geologia** – (Portuguese association for Earth science teachers – APPBG) in Portugal
  - **Asociación Española para la Enseñanza de las Ciencias de la Tierra** (Spanish Association for the Teaching of Earth Sciences - AEPECT) in Spain,
  - **Earth Science Teachers' Association** (ESTA) in the UK and
  - Earth science section of the **Associazione Nazionale Insegnanti di Scienze Naturali** (National Association of Natural Sciences Teachers - ANISN) in Italy.

#### **Chief products and accomplishments of IUGS-COGE in 2017/18**

1. Contributions to the **First International Conference on Geosciences**, Morocco, 2018.
2. Contributions to the **Resources for Future Generations (RFG)** conference, June 2018.
3. Contributions to the IGEO's **GeoSciEd VIII** conference in Brazil, July 2018.
4. Online publication of the international version of the **international geoscience textbook**; regional versions will be developed from this for further online publication; diagram re-drawing was financed by IUGS.
5. Support for the publication of the e-book, Greco, R. & Almberg, L. (ed)(2018) *Earth Science Education : global perspectives*.
6. Support for the international geoscience education survey, which was completed, and will be published in Spring 2019 as the **IPGG/UNESCO – IGEO international geoscience education survey** in two volumes, one focussed on Latin America, the other focussed on 35 non-Latin American countries linked with IUGS-COGE and IGEO.
7. The **Earthlearningidea** website, which continues to publish a new teaching idea every two weeks. Milestones reached in 2018 were: 300 activities in English; 1000 translations into 12 different languages, 4 million pdf downloads (averaging more than 45,00 per month).

## Publications

1. King, C. (2019) 'Exploring Geoscience – across the globe'. Online publication, the International Geoscience Education Organisation: <http://www.igeosci.org/teaching-resources/geoscience-text-books/>. ISBN: 978-1-9996264-0-2.
2. Greco, R. & Almborg, L. (ed)(2018) *Earth Science Education : global perspectives*. Pouso Alegre: ifsuldeminas. ISBN: 987-85-67952-14-7.
3. King, C., Kennett, P & Devon, E. (2018) Earthlearningidea - a global geoscience teaching resource. *First International Congress on Geosciences, El Jadida, Morocco - Abstract Book*. 135-6
4. King, C. (2018) A free-to-download geoscience textbook for your country/region? *First International Congress on Geosciences, El Jadida, Morocco - Abstract Book* 137-8.
5. King, C., Kennett, P & Devon, E. (2018) Earthlearningidea - a global online geoscience teaching resource. Published by EGU online at: <https://meetingorganizer.copernicus.org/EGU2018/presentations>.
6. King, C. (2018) A free-to-download geoscience textbook for your country/region? Published by EGU online at: <https://meetingorganizer.copernicus.org/EGU2018/presentations>.
7. King, C. (2018). The international version of the free-to-download geoscience textbook for 16 year olds: now regional versions? *Geoscience Teaching and History, proceedings of GeoSciEd 2018: 8<sup>th</sup> Quadrennial Conference of the International Geoscience Education Organisation (IGEO)*, 109-113. Brazilian Society of Geology. IBSN: 978-85-479-0067-0.
8. King, C. (2018). The 'My Earth Science Educator Story' initiative. *Geoscience Teaching and History, proceedings of GeoSciEd 2018: 8<sup>th</sup> Quadrennial Conference of the International Geoscience Education Organisation (IGEO)*, 114-120. Brazilian Society of Geology. IBSN: 978-85-479-0067-0.
9. King, C. (2018) UNESCO-IGEO experts survey on geoscience education: Earth science in primary and secondary education. *Geoscience Teaching and History, proceedings of GeoSciEd 2018: 8<sup>th</sup> Quadrennial Conference of the International Geoscience Education Organisation (IGEO)*, 131-136. Brazilian Society of Geology. IBSN: 978-85-479-0067-0.
10. Devon, E., King, C. & Kennett, P. (2017) Rock power: geothermal simulations for schools. *European Geologist* 43, 60 – 62. ISSN 1028-267X
11. King C. (2017) Scottish 'Bring and Share - from the St. Andrews ESTA Conference, Sept. 2016. *Teaching Earth Sciences* 42.1. 13 – 25. ISSN 0957-8005.
12. King, C. (2017) Calling all ESTA members: How can we help to 'mobilise' geoscientists and students across the nation to bring geoscience to the public at large? *Teaching Earth Sciences*, 42.2, 12 – 13. ISSN 0957-8008
13. King, C. (2017) 'Killer facts' supporting geology in schools and colleges. *Teaching Earth Sciences*, 42.2, 14 – 19. ISSN 0957-8008
14. King, C. (2017) Geosciences Information for Teachers, Vienna, 2017. *Teaching Earth Sciences*, 42.2, 63 – 65. ISSN 0957-8008
15. Shankar, R., Orion, N., King, C., Warriar, A., Narahari, A.M., & Swamy, S.G.S. (2017) Teacher training workshops in India – a report. *Teaching Earth Sciences*, 42.2, 66 – 70. ISSN 0957-8008
16. Kennett, P., King, C. & Devon, E. (2017) Earth science activities and ideas for learning geology to the world. *ASRO Journal of Education*, 2.1, 1-4.



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**Strategy for Enhancing Geoscience Education – 2018**  
*‘Inspiring, updating and supporting geoscience teachers and educators’*

**The European Geosciences Union Committee on Education (EGU-CoE)**

### **Summary**

The European Geosciences Union (EGU) Committee on Education (CoE) has devised this strategy report in response to a request from EGU Council and in the light of research which shows:

- the ‘health’ of school-level geoscience education across Europe and beyond is worrying;
- the most effective way to target geoscience education is to focus on teachers rather than pupils;
- providing good teaching materials is not enough – educators need to be shown how to use the materials most effectively.

The strategy described in this document has been devised in support of EGU’s *‘pursuit of excellence’* with the strapline of *‘Inspiring, updating and supporting geoscience teachers and educators’*. Five groups of teachers and educators have been identified. They are:

9. teachers of geoscience in schools and colleges with strong geoscience backgrounds;
10. teachers of science or geography with some geoscience in their teaching, who have weak geoscience backgrounds;
11. teachers of geoscience in Higher Education;
12. providers of informal geoscience education;
13. researchers into geoscience education.

The strategy proposes that these groups are supported as follows:

#### **2. Teachers of geoscience in schools and colleges with strong geoscience backgrounds**

- a) Maintaining the high profile and successful Geosciences Information for Teachers (GIFT) conferences/workshops by supporting four types of GIFT conference/workshop:
  - the annual EGU General Assembly GIFT conference in Vienna;
  - EGU GIFT conferences offered as part of international geoscience conference such as International Geoscience Congresses (IGCs);
  - ‘capacity building’ sequences of EGU GIFT workshops in less economically developed countries offered on a sliding funding scale over a four-year time span;
  - EGU GIFT dynamic Earth workshops for school teachers and early career academics in geoscientifically dynamic areas of Europe.
- b) The coordination of international and national geoscience educator organisations across Europe through the formation of an EGU/IGEO European Chapter (IGEO is the International Geoscience Education Organisation and already has a South American chapter)

#### **2. Teachers of science or geography with some geoscience in their teaching, who have weak geoscience backgrounds**

In a 2019/20 pilot initiative, EGU will appoint, train and provide expenses for EGU geoscience education field officers in four European countries who will offer professional development to teachers of science and geography at regional and national conferences for science or geography teachers. If the pilot is successful, the initiative will be extended to more European countries in future years.

#### **4. Teachers of geoscience in Higher Education**

New members are being appointed to the Committee on Education to devise new initiatives to support the professional development of geoscience teachers and lecturer in Higher Education across Europe. Their proposals will be included in the CoE budget for 2020 and beyond.

#### **5. Providers of informal geoscience education**

The support of this large and diverse group of people should fall to the EGU Outreach Committee. The EGU Committee on Education stands ready to support any proposals targeting this group which are developed by the Outreach Committee.

#### **6. Researchers into geoscience education**

There are few geoscience education researchers across Europe, in comparison with the strong geoscience education communities elsewhere in the world. During 2019/20 further research will be carried out into this group of people to find how they can best be supported. Proposals developed from this research will be included in the CoE budget for 2020 and beyond.

The strategies outlined in this document will all be enhanced by the appointment of an EGU Education Officer to support this work, under the direction of the CoE Chair.

This report contains a budget request for 2019 and indicative budgets until 2023. By supporting these requests, the EGU will maintain its *'pursuit of excellence'* by *'inspiring, updating and supporting geoscience teachers and educators'* across Europe and beyond.

**Appendix 5. The IUGS-COGE 'Call' for national Geoscience Education Field Officers in counties beyond Europe.**



## **Call for IUGS-COGE/IGEO Geoscience Education Field Officer**



The International Union of Geological Sciences Commission on Geoscience Education (IUGS-COGE) and the International Geoscience Education Organisation (IGEO) jointly are seeking to appoint IUGS/IGEO Geoscience Education Field Officers in countries beyond Europe with the major role of providing professional development to school teachers, who have elements of geoscience in their teaching curriculum, through interactive workshops. Priority will be given to those countries where the work of such Field Officers is likely to have most effect.

The two-day training programme for successful applicants will take place in Vienna in April 2019.

In first year of this pilot initiative (2019/20), four posts will be available.

These positions are unpaid, but funding may be available as follows:

- a bid has been submitted to the IUGS to fund the costs of travel and accommodation in Vienna for the training of the individuals alongside the training of European Geosciences Union (EGU) Geoscience Education Field Officers;
- a second bid has been submitted to IUGS for the funding of workshop apparatus and materials;
- a third bid has been submitted to IUGS to support the travel and registration fees for Field Officers to attend teacher conferences (science, geography or primary/elementary teachers as appropriate) in their own countries.

If none of these bids are successful, Field Officers will receive no funding for training or for providing workshops, but nevertheless, training is a compulsory part of the appointment. If all three bids to the IUGS are successful, Field Officers will receive the same level of funding as their EGU counterparts.

Individuals appointed will ideally:

- be willing to represent IUGS and IGEO amongst geoscience teachers and educators in their own country;
- be willing to liaise with a small group of IUGS/IGEO-recognised supporters in their own country;
- be fully available for work, and so are unlikely to have a full-time position;
- hold a university degree containing at least 40% broad geoscience;
- have wide experience of teaching geology, science or geography;
- be willing to respond to new teaching ideas and approaches;
- be willing to seek out and travel to conferences of school teachers of geography, science or primary-age pupils in their country and region in order to present (in their own language) interactive workshops to the conference participants;
- be willing to present training to people working in informal geoscience education, such as in geoparks, aspiring geoparks, the museum sector and other similar institutions, when funded by the institutions;
- be willing to undertake a two-day training programme in presenting interactive workshops; training will be by experienced trainers with expertise in presenting curriculum-focussed interactive professional development workshops in many countries - the training is linked with the EGU General Assembly in Vienna, Austria in April 2019;
- be willing, with guidance, to formulate interactive workshops appropriate for the curriculum in their own countries (with or without translation from English);
- be willing (if funded) to attend an annual meeting of Geoscience Education Field Officers linked with the EGU General Assembly, to provide a brief report on their activities;

- be willing to purchase locally all the apparatus and materials needed to support and maintain the workshops (expenses may be reclaimable);
- be willing to collect evaluation data from each workshop presented and to provide simple analyses of the data;
- be willing to provide information on the background and progress of geoscience education in their own countries, when prompted.

Application is by sending a motivation letter (occupying no more than a single A4 page) and a curriculum vitae (CV) to the Chair of the IUGS Commission on Geoscience Education, Chris King, at: [chris@earthlearningidea.com](mailto:chris@earthlearningidea.com) The motivation letter should refer to the motivation of the individual applying, the state of geoscience education in their country, and how the provision of interactive workshops is likely to have impact.

## **Appendix 6. A job description for the IUGS Commission on Geoscience Education members**

### **The Role of an International Union of Geological Sciences Commission on Geoscience Education (IUGS-COGE) Member**

Commissioners are highly valued by IUGS-COGE as national representatives and as contributors to IUGS-COGE objectives and initiatives. Their role includes the following.

For their own countries and regions, IUGS-COGE Commissioners are expected to:

- publicise IUGS and IUGS-COGE;
- disseminate information on the educational strands of international conferences, and other activities which IUGS-COGE supports, together with other IUGS-COGE initiatives;
- provide feedback to IUGS-COGE on the state of geoscience education and on activities and initiatives that support geoscience education in their own areas;
- attend IUGS-COGE meetings where possible;
- renew their wish to remain as IUGS-COGE Commissioners every four years.

IUGS-COGE members agree:

- to support IUGS rules and statutes;
- to allow their email address to be publicised on the IUGS-COGE website to promote international networking;
- to support the geoethical promise found at: <http://www.geoethics.org/geopromise> ;
- in all their activities related to IUGS-COGE, to behave professionally and respectfully and not become involved in discrimination, bullying, harassment or intimidation of any kind.

## **Appendix 7. IUGS-COGE budget 2017/18**

Funds from the IUGS for COGE are administered by the COGE Secretary/Treasurer and are currently held at the University of Adelaide in Australia.

- At the time of the last IUGS-COGE report, US\$1527 was remaining from previous years – equivalent to A\$1769 at the time.
- IUGS-COGE received A\$2573 from IUGS in May 2017
- IUGS-COGE received A\$6455 from IUGS in July 2018
- Interest received on account A\$4

**Total funds received = A\$10801**

Expenditure since last IUGS-COGE report

- Reimbursement to C. King for attendance at IUGS Executive meeting, Paris, March 2017 – A\$699
- Reimbursement to C. King for attendance at IUGS Executive meeting, Potsdam, Feb 2018 – A\$768
- Reimbursement to C. King for attendance at '*Earth Sciences for Society*' conference, Morocco, March 2018 – A\$2189
- Reimbursement to C. King for attendance at '*Resources for Future Generations*' conference, Canada, July 2018 – A\$4443
- Honorarium to T. Reinhardt for re-drawing of '*Exploring Geoscience – across the globe*' international textbook diagrams – A\$1000
- Website fees – A\$115
- Account fees – A\$126

**Total outgoings = A\$9340**

**Sum remaining at 14.1.19 = A\$1461 = US\$1052.**

## Appendix 8. IUGS-COGE budget request for 2019/20, with indicative requests until 2022/23.

This is taken from a spreadsheet – also submitted.

IUGS Commission on Geoscience Education	Exchange rate	Bid for 2019/20		% inf	Indicative bids + 3% inflation		
					20/21	21/22	22/23
\$-£ exchange / inflation rate	1.29			3			
<b>Priority 1 2019/20</b>	<b>£</b>		<b>US\$</b>				
Funding for IUGS-COGE Chair to attend annual IUGS Executive Committee meetings (assumed to be in Europe)							
Driving to airport	£16		\$ 21				
Flights	£400		\$ 516				
Airport parking	£65		\$ 84				
Travelling at destination	£20		\$ 26				
Hotel accommodation/meals	£400		\$ 516				
<b>Total</b>		<b>\$ 1,162</b>			<b>\$ 1,197</b>	<b>\$ 1,233</b>	<b>\$ 1,270</b>
<b>Priority 2 2020/21</b>							
Funding for IUGS-COGE Chair to attend International Geological Congress (IGC) in Delhi, India							
Driving to airport	£16		\$ 21				
Flights	£580		\$ 748				
Airport parking	£70		\$ 90				
Travelling at destination	£30		\$ 39				
Hotel accommodation/meals	£600		\$ 774				
IGC registration (based on RFG registration)	£140		\$ 181				
<b>Total</b>					<b>\$ 1,852</b>		
<b>Priority 3 2019/20</b>							
Funding estimation for IUGS/IGEO Geoscience Education Field Officers to attend training/regular meeting in Vienna x 4	Per person						
Flights (based on India - USD705, Brazil - USD795, Nigeria - USD980, Phillipines - USD1070; Mexico USD1300)	\$ 770						
Return travel to airport	\$ 75						
Accommodation in Vienna	\$ 700						
Travel in Vienna	\$ 15						
<b>Total</b>	<b>\$1,560</b>	<b>\$ 6,240</b>			<b>\$ 6,427</b>	<b>\$ 6,620</b>	<b>\$ 6,819</b>
<b>Priority 4 2019/20</b>							
Workshop kits for IUGS/IGEO Field Officers - apparatus and materials purchased locally	\$ 500	\$ 2,000					

<b>Priority 5 - estimated 2019/20</b>							
National travel for Field Officer to attend 5 teacher conferences per year	\$ 400						
Registration at 5 teacher conferences per year	\$ 250						
Overnight stay at two conferneces per year	\$ 100						
<b>Total</b>	<b>\$ 750</b>	<b>\$ 3,000</b>			<b>\$ 3,090</b>	<b>\$ 3,183</b>	<b>\$ 3,278</b>
<b>Total cost of field officer initiative (Priorities 3, 4 and 5 together) 2019/20</b>			<b>\$11,240</b>		<b>\$ 9,577</b>	<b>\$ 9,865</b>	<b>\$ 10,160</b>
<b>Priority 6 2019/20</b>							
Funding to support the IUGS-COGE Chair in attending international conferences with educational strands (e.g. the Geoscience for Society (GeoSoc) conference in Bangladesh (postponed from 14-17 March 2019)							
Driving to airport	£16		\$ 21				
Flights	£740		\$ 955				
Airport parking	£65		\$ 84				
Travelling at destination	£20		\$ 26				
Registration including accommodation			\$ 375				
<b>Total</b>		<b>\$ 1,460</b>			<b>\$ 1,504</b>	<b>\$ 1,549</b>	<b>\$ 1,595</b>
<b>Priority 7 - for 2020/21</b>							
Funding estimation for additional IUGS/IGEO Geoscience Education Field Officers to attend training/regular meeting in Vienna x 4					<b>\$ 6,427</b>	<b>\$ 6,620</b>	<b>\$ 6,819</b>
<b>Priority 8 - for 2020/21</b>							
Workshop kits for IUGS/IGEO Field Officers - apparatus and materials purchased locally					<b>\$ 2,060</b>		
<b>Priority 9 - for 2020/21</b>							
National travel, registration and accommodation for Field Officer to attend 5 teacher conferences per year					<b>\$ 3,090</b>	<b>\$ 3,183</b>	<b>\$ 3,278</b>
<b>Priority 10 - for 2021/22</b>							
Funding estimation for additional IUGS/IGEO Geoscience Education Field Officers to attend training/regular meeting in Vienna x 4						<b>\$ 6,620</b>	<b>\$ 6,819</b>

<b>Priority 11 - for 2021/22</b>							
Workshop kits for IUGS/IGEO Field Officers - apparatus and materials purchased locally						\$ 2,122	
<b>Priority 12 - for 2021/22</b>							
National travel, registration and accommodation for Field Officer to attend 5 teacher conferences per year						\$ 3,183	\$ 3,278
<b>Priority 13 - for 2022/23</b>							
Funding estimation for additional IUGS/IGEO Geoscience Education Field Officers to attend training/regular meeting in Vienna x 4							\$ 6,819
<b>Priority 14 - for 2022/23</b>							
Workshop kits for IUGS/IGEO Field Officers - apparatus and materials purchased locally							\$ 2,185
<b>Priority 15 - for 2022/23</b>							
National travel, registration and accommodation for Field Officer to attend 5 teacher conferences per year							\$ 3,278
<b>Totals - including all priorities</b>		\$ 13,862			\$ 25,648	\$ 34,312	\$ 45,438
Priority 1 and 3 only		\$ 7,402					
Priority 1, 3 and 4 only		\$ 9,402					
Priority 1 and 3-5 only		\$ 12,402					
		<b>Bid for 2019/20</b>			<b>20/21</b>	<b>21/22</b>	<b>22/23</b>