

# Survey of Hiring Practices in Geoscience Industries, 2010

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## **Executive summary**

This project was carried out in order to obtain information aimed at helping the Department of Earth and Ocean Sciences at UBC (a) advise students regarding decisions that affect their careers; (b) develop and maintain appropriate and stimulating curriculum; and (c) recruit students into our programs. It was conducted as part of the Earth and Ocean Sciences Science Education Initiative (EOS-SEI)<sup>2</sup>.

Sixty four face-to-face interviews were conducted in January 2010 with individuals working at tradeshow booths at the Mineral Exploration Roundup trade show and convention in Vancouver. Individuals who were interviewed work in companies of all sizes, with a wide range of experience and seniority, and in the environmental, engineering, mineral exploration, mining, geochemistry, geophysics and a few other related sectors. The questions used in interviews are given in the Table of Contents in the order in which data are presented.

Consistent themes regarding expectations that emerged from the interview data are as follows.

- UBC's EOS undergraduate programs were recognized to be well aligned with current professional opportunities in the relevant industries, and characterized as *"an asset"* or *"having a good reputation"*.
- UBC graduates were generally characterized as *"knowledgeable"* and *"hardworking"*.
- No fundamental technical areas were singled out as lacking in EOS degrees, although a few interviewees said they wanted students to be familiar with a specific tool or software program. There were also a few comments about a lack of understanding about *"how the industry works"*.
- Most interviewees would prefer the EOS Majors degree to have a more clearly defined title.
- Non-academic qualifications that are attractive to employers include experience in work-related or co-op jobs and exchange programs. Research experience and a minor component to a degree were less interesting.
- The need for field work experience and attitudes consistent with doing field work were persistent themes.
- Many employers want focused employees with discipline-specific experience and training. This is not surprising since companies want young employees to be productive as quickly as possible, but it is surprising that few interviewees explicitly identified the benefits of breadth and depth that a university degree should provide.
- Strong writing, communication and team working skills were consistently identified as important.
- Cooperative and self-directed attitudes about work, expectations for advancement and understanding of how companies and industry work were all important to employers.
- Some shortcomings mentioned by several interviewees include *"unrealistic expectations"* and *"not willing to do field work or get dirty"*.

Results of this interview-based survey are being made available in several ways to the Faculty of Science, the Department of Earth and Ocean Sciences, teaching faculty and students. The full report<sup>3</sup> also includes recommendations about how to improve the data itself and the process of obtaining it.

The following are thanked for major contributions, either in data acquisition, analysis and reporting, and/or advice: Kerry Ko<sup>4</sup>, Joshua Caulkins<sup>1</sup>, Devin Tompkins<sup>2</sup>, Sara Harris<sup>5</sup>

<sup>1</sup> Science Teaching and Learning Fellow, Department of Earth and Ocean Sciences (EOS), UBC.

<sup>2</sup> <http://www.eos.ubc.ca/research/cwsei/>

<sup>3</sup> <http://www.eos.ubc.ca/research/cwsei/resources/HiringPracticesEOS-2010.pdf>

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## **Introduction**

The project was carried out as part of the Earth and Ocean Sciences Science Education Initiative, in order to obtain information that will help the Department of Earth and Ocean Sciences at UBC (a) advise students regarding decisions that affect their careers; (b) develop and maintain appropriate and stimulating curriculum; and (c) recruit students into our programs.

This report describes the scope and results of 64 face to face interviews conducted in January 2010 to learn about hiring practices in geosciences industries associated with mineral exploration, mining and associated environmental and engineering disciplines. Recommendations based on results are summarized separately.

The pool of interviewees was limited to individuals working at tradeshow booths during the Vancouver-based Mineral Exploration Roundup trade show and convention. Most delegates are local to British Columbia and Western Canada, many are Canadian, and some are multinational. This event is highly respected by the relevant industries, but it is not the largest of its kind in the world. We did not interview people from all career options open to EOS graduates, nor did we obtain exhaustive coverage of all opportunities within any one company or sector. However the information does provide a glimpse into needs and expectations of those we talked to, and as such can help students, Department faculty and administrators improve the relevance of EOS degree programs and the preparedness of our graduating students. The methods can also be applied in other disciplines, and online procedures for obtaining updates in subsequent years may be developed based on outcomes of this project.

This report also includes recommendations about how to improve the data itself and the process of obtaining it. The complete report is being delivered to the Faculty of Science, the Department of Earth and Ocean Sciences, teaching faculty and students, and can be seen online at

<http://www.eos.ubc.ca/research/cwsei/resources/HiringPracticesEOS-2010.pdf> .

## **Methods**

A preliminary survey of geophysics professionals was first conducted in October 2009 (See results in Appendix A4). Based on that experience, an interview protocol was developed, then used at the Mineral Exploration Roundup trade show and convention for mining and related industries, Vancouver, January 18-21, 2010.

Questions of primary interest for the Department, faculty members and students were:

- Key skills that employers expect graduates to be able to do;
- Personal attributes and attitudes that employers expect;
- New skills which the next generation of practitioners will need;
- Persistent shortcomings in recent bachelor level graduates;
- Types of companies hiring into each profession, and recruitment methods;
- Preference for school;
- Impressions of UBC students;
- Employers' interpretation of a "Majors degree in Earth and Ocean Sciences";
- Level of employers' interest in different qualifications while assessing resumes.

Data were collected by two senior undergraduate students and two geoscience education support professionals by asking delegates at the trade show if they could spare a few minutes to answer some questions. Responses were noted on forms by hand during the ensuing conversation. Notes were subsequently transcribed into a spreadsheet by one of the undergraduate students. Analysis involved identifying common response patterns so that data could be summarized graphically. A more detailed outline of methods is given in Appendix A1 and the form used during interviews is reproduced in see Appendix A2.

## Scope of the Survey

A total of 64 individuals were interviewed representing 47 different companies of several types (Table 1). The sample sizes for each industry are not large, and not all EOS programs are represented. However, the overall sample size is respectable, so the results should provide useful indications to faculty and students involved in relevant disciplines.

Some companies had delegates from different divisions, and some interviewees did not provide clear data in all information categories. These are examples of challenges related to data acquisition involving 4 different interviewers carrying out open-ended interviews with un-prepared volunteer interviewees.

**Table 1:** Scope of individuals and companies interviewed.

<b>Company Types ( # companies / # respondents):</b> <ul style="list-style-type: none"> <li>Environmental (7 / 13)</li> <li>Engineering (7 / 11)</li> <li>Mineral Exploration/Mining (14 / 14)</li> <li>Geochem Lab (8 / 11)</li> <li>Geophysics (5 / 7)</li> <li>Others – drilling, satellite imaging, etc. (8 / 8)</li> </ul>	<b>Company sizes:</b> <ul style="list-style-type: none"> <li>19 had less than 20 employees;</li> <li>12 had 20-100 employees;</li> <li>15 had 100 – 1000 employees;</li> <li>7 had more than 1000 employees</li> </ul>
<b>Respondents: years of experience in Industry:</b> <ul style="list-style-type: none"> <li>8 had 0 – 4 years of experience;</li> <li>9 had 4 – 10 years of experience;</li> <li>15 had 10 – 20 years of experience;</li> <li>12 had over 20 years of experience</li> </ul>	<b>Respondents: roles in hiring:</b> <ul style="list-style-type: none"> <li>34 involved in hiring entry level employees</li> <li>29 involved in hiring senior level employees</li> <li>41 worked with entry level employees</li> <li>8 not involved in hiring at all</li> </ul>

## Recommendations based on all data

These recommendations are based on interpretations of all the data and on specific remarks from interviewees. Data themselves are presented in a subsequent section. Another project mandate was to communicate our experiences with other Departments to help them obtain similar high quality data in their own fields. These recommendations are in Appendix A3.

## Recommendations for the Department

- Advising students:
  - Recognize that, based on question 5 results, it seems that having a minor attached to a degree, or research experience, are apparently of lesser interest to industry.
  - Tell students that those who have been active in their discipline outside of school are apparently most employable. This is not a surprise, but it is useful to see the consistency of comments. (Based on Q5.)
- Regarding technical skills: some interviewees suggested the following skills would be useful additions to a student's degree: environmental regulations, geostatistics, resource estimation, and mineral exploration practices such as rock & soil sampling.
- Regarding soft skills (e.g. team work, project management, communication, etc.):
  - Articulate soft skills in program- and course-level learning goals, and indicate where these are taught and practiced.
  - Provide many opportunities to submit assignments in different kinds of formal formats.
  - Discuss at the curriculum level possibilities, opportunities, challenges, and reasonable expectations for development of written (and other) communication skills.

- A technical communication course such as APSC 201<sup>6</sup>, might be incorporated into programs, or at least recommended. (Based on Q6.)
- Refer to the EOS Department's exit survey data<sup>7</sup> for student perceptions about where skills are acquired.
- Build better web-based information:
  - Increase the awareness and understanding of degree programs.
  - Point students to UBC mentoring programs such as the EOS Tri-Mentoring Program.
- Consider incorporating short term computer courses into program options (eg. AutoCAD, ArcGIS)? (Based on Q6.)
- Increase the awareness of our Department among the industry through co-op, public relations at tradeshow, conferences, industry nights, etc.
- Reintroduce specific majors degrees (in progress, summer 2010).
- Collecting similar data in subsequent years will clarify the persistence of the hiring needs and expectations of geosciences industries, and point to evolving trends. This could be done by converting the questions (Appendix A2) into an electronic online version. However, cooperation of interviewees in the trade show setting was excellent and response rates to online surveys can be low. The Department will have to decide on costs and benefits of repeating this hiring practices survey.

## Recommendations for students

- Recognize the wide variety of tactics used by employers to recruit new employees, especially how "Word of mouth and networking" is a very close second to "company websites". In other words, make every effort to meet people working in areas you are interested in.
- Make use of various UBC Tri-Mentoring Programs<sup>8</sup>.
- Use UBC's career services<sup>9</sup> to help prepare for meetings with future employers.
- Co-op programs are a well recognized opportunity for getting help finding those first jobs and for gaining work related experience. See <http://coop.ubc.ca/> for details of UBC co-op opportunities.
- Attend Alumni Dinner, industry night and other networking events (eg. Women in Science and Engineering).
- On resumes:
  - Consider identifying core courses under the degree name. This will provide employers with a clear idea of which area you are specialized in.
  - Identify if courses were chosen with a view to future professional certification (P.Eng or P.Geo).
- The more you are busy outside of school the better! Data from Q5 have "exchange" high on the list compared to purely academic aspects. However – if an immediate post-graduate degree is a more likely pathway for you, then research experience, or perhaps adding a minor to your degree, are certainly recommended.
- Some other skills that were identified as likely to be useful are: environmental regulations, business management, geostatistics, resource estimation, and mineral exploration practices such as rock & soil sampling.
- Based on questions about key skills (Q6):
  - Technical writing and oral communication of all types are crucial. These are life-long skills that even senior people continue to develop. Welcome opportunities to practice, and ask for lots of feedback.

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<sup>6</sup> APSC 201 calendar description: "Written and oral communication in engineering. Report preparation, business correspondence, and oral presentation of technical material".

<sup>7</sup> See "EOS Exit Survey: Views of Graduating EOS Students" at <http://www.eos.ubc.ca/research/cwsei/research.html>.

<sup>8</sup> Several departments including EOS have tri-mentoring programs specific to their disciplines. A general starting point is student resources at the Faculty of Science: <http://www.science.ubc.ca/students/resources/mentoring>.

<sup>9</sup> Many resources are available starting at <http://www.students.ubc.ca/careers/>. Some examples are resume preparation, interview workshops, career advising, including providing feedback on resumes and cover letters, assisting with job interview skills, and discussing career questions during personal advising sessions.

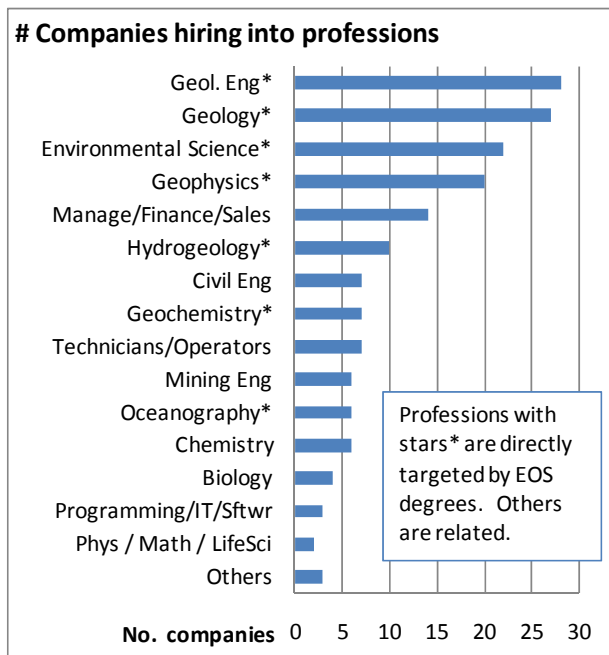
- Team work (the second most important “soft skill”) is a skill you can learn, especially when team members are not ideal colleagues. Try to improve your abilities as a good team-member at every opportunity.
- The ability and willingness to do field work seems to be (currently) a common requirement for industry.
- Comfort with standard office computer applications is needed in all industries. Proficiency using Excel is particularly important.
- Personal attributes: Based on Q7 ...
  - Employers believe that the more students are willing to do, the more valuable they are. They encourage students to be prepared to do anything from office to dirty work, including field work and travel.
  - A few respondents mentioned that “Attitude is number 1”, “I know some PhDs... They are smart, but they are useless in terms of personality and teamwork”.
- Work is expected to be further computerized, so familiarity with modelling, programming, project management, databases and other related technologies will become increasingly important. Short courses at institutions such as BCIT on specific programs such as ArcGIS and AutoCAD may help students to be more marketable.

## Presentation of the data

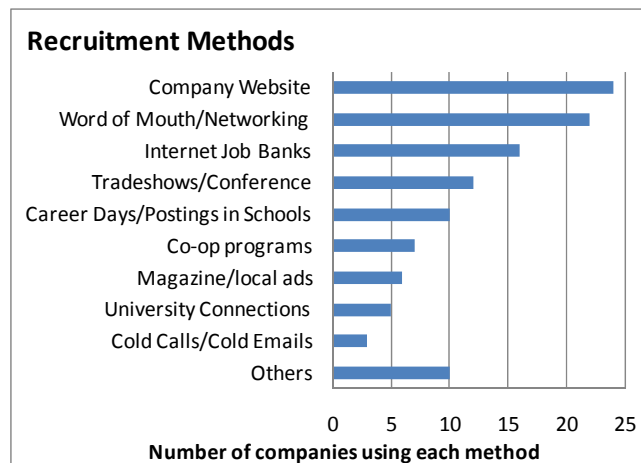
Results of interview questions are summarized graphically or in tables, with comments following each data set.

### 1. Companies that hire into each profession and their recruitment methods

**Question posed:** What types of professionals do you hire? (check all that apply)



**Question posed:** How does your company normally recruit entry-level employees and where are job openings normally publicized?

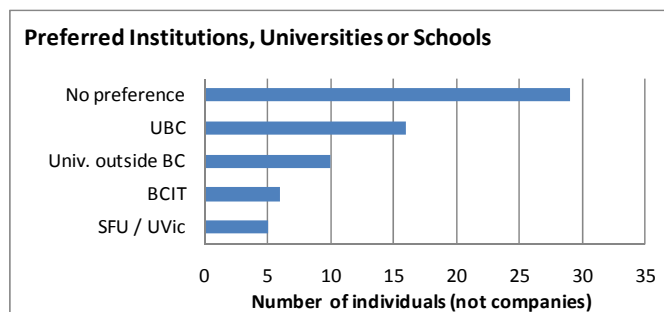


**Comments:** The top four professions these companies are hiring for, and three other professions, are directly targeted by UBC EOS degree programs. Also, results will have a local Vancouver perspective. In other words, the professions in most demand would likely differ if this survey was carried out elsewhere (e.g. Calgary or Toronto).

## 2. Preference for school

**Question posed:** What specific institution, universities or schools (eg. Preferred sources) does your company hire from?

**Comments:** Most individuals did not have any particular preference. Those respondents mentioning institutions other than UBC identified specific programs which more closely fit their companies' needs. One company director (a UBC Mining Engineering graduate) mentioned that UBC is not "focused" enough and he preferred graduates from a local technical college. Two individuals named specific universities and colleges that provide more specific and relevant (to them) topics or programs.



However, specific programs tend to produce a narrower education experience, which is fine for those who are very clear about career pathways, but may be limiting for individuals interested in a wider range of options, and who want to benefit from the educational opportunities available at a major university.

## 3. Impressions of UBC students

<p><b>Questions posed:</b></p> <ul style="list-style-type: none"> <li>If you have hired or worked with UBC graduates, what was your impression of them?</li> <li>From what programs at UBC have they come from (if known)?</li> </ul>	<p><b>No. Individuals who hired or worked with UBC grads:</b></p> <table border="1"> <tbody> <tr> <td>EOSC</td><td>12</td></tr> <tr> <td>Engineering</td><td>10</td></tr> <tr> <td>Others (eg. Life Sci, Physics, Geography)</td><td>6</td></tr> <tr> <td>Bio/Chem/Biochem</td><td>5</td></tr> <tr> <td>Forestry</td><td>2</td></tr> <tr> <td><b>total</b></td><td><b>35</b></td></tr> </tbody> </table>	EOSC	12	Engineering	10	Others (eg. Life Sci, Physics, Geography)	6	Bio/Chem/Biochem	5	Forestry	2	<b>total</b>	<b>35</b>
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Forestry	2												
<b>total</b>	<b>35</b>												
<p><b>Egs of good impressions (25 of 31 respondents):</b></p> <ul style="list-style-type: none"> <li><i>hardworking;</i></li> <li><i>smart; fast learner;</i></li> <li><i>knowledgeable; eager;</i></li> <li><i>fine to work with</i></li> <li><i>UBC has asset over other schools ...</i></li> <li><i>reputation is good for geol/mining industry</i></li> </ul>	<p><b>Egs of less good impressions (6 of 31 respondents):</b></p> <ul style="list-style-type: none"> <li><i>not focused enough compared to BCIT;</i></li> <li><i>better programs (for us) in Thunderbay, Camosun;</i></li> <li><i>poor technical writing skills;</i></li> <li><i>too theoretical;</i></li> <li><i>don't like dirty lab work</i></li> </ul>												

**Comments:** Respondents usually found UBC students and graduates are hardworking, smart, knowledgeable, eager and fun to work with. A few mentioned that UBC graduates are too theoretical or lack technical writing skills.

## 4. Meaning of a Majors degree in Earth and Ocean Sciences

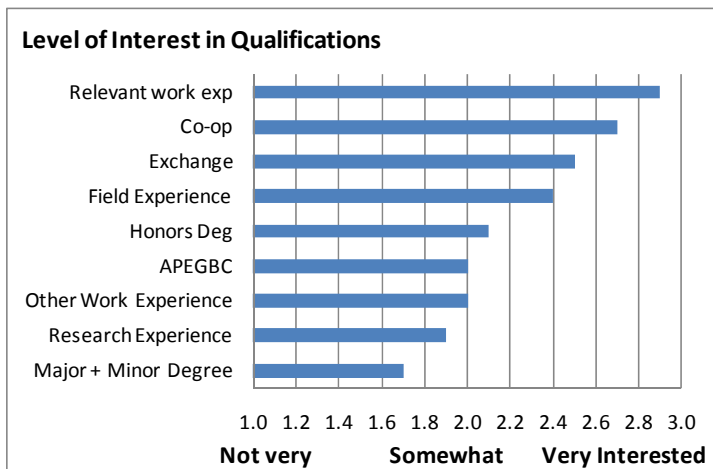
<p><b>Question posed:</b></p> <p>Many of our students graduate with a "Major in Earth and Ocean Sciences". What does this mean to you?</p>	<p><b>Of the 43 responses to this question ...</b></p> <p>16 said a combination of geology, oceanography, earth, and/or hydrology.</p> <p>14 said it was "too general" or "not specific"</p> <p>8 said "I don't know"</p> <p>5 referred to biology, environment, evolution or natural resources.</p>
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<p>8 individuals didn't know what this degree means; e.g.</p> <ul style="list-style-type: none"> <li>“it means nothing to me”</li> <li>“no idea what it means”</li> </ul>	<p><b>Examples of specific comments:</b></p> <p>14 individuals thought that this degree name is too general/not specific: “confusing”; e.g.</p> <ul style="list-style-type: none"> <li>“so big .... I guess the whole physical environment”</li> <li>“which group is it? Biologist? Geologist? Ecologist?”</li> <li>“doesn't seem specifically trained for geology”</li> <li>“it means everything.... covers the whole earth”</li> </ul>
<p>Other comments:</p> <ul style="list-style-type: none"> <li>“it is attractive to our company”</li> <li>“anything but multidisciplinary”</li> <li>“would step back if we see this because it looks like it is related to environmental studies”.</li> </ul>	<p>Two alumni of UBC Geology said....</p> <ul style="list-style-type: none"> <li>“EOSC isn't a good thing .... Geology is better when distinguished from the rest.”</li> <li>“I'm so happy that I graduated before the programs combined .... Can distinguish from other general programs”</li> </ul>

## 5. Level of interest in different qualifications when assessing resumes

**Question posed:** When assessing resumes, how interesting are the following types of qualifications? (Choose from 1=not very, 2=somewhat or 3=very.)

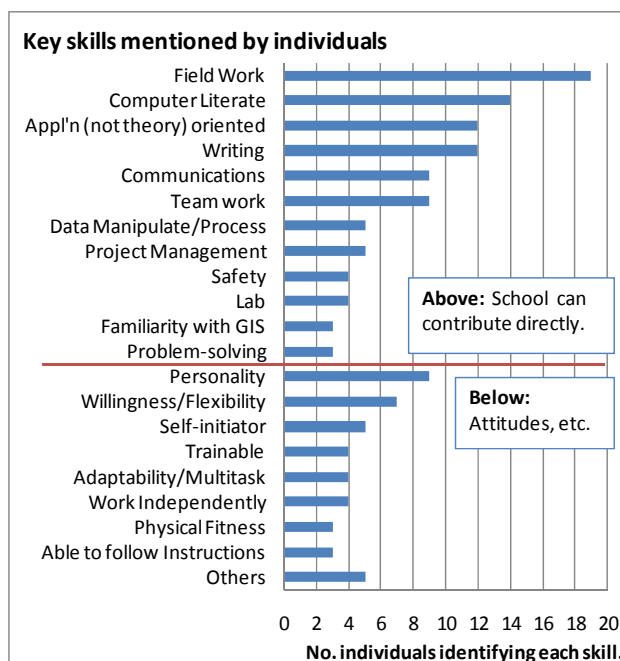


## 6. Key skills graduates are expected to have

**Question posed:** What are 2 or 3 key skills you want recent graduates you hire to be able to do?

**Comments:** This data set represents “what first comes to mind” during an interview. Interesting observations are:

- Field skills (mapping, logging, etc) are noted by most.
- Computer literacy, especially Microsoft.
- Over 90% of individuals from environmental or engineering firms expected graduates to be able to have good writing skills.
- Teamwork is seen as a “skill”, and is high on the list.
- “Personality” is vague, but may imply they want people who are easy to get along with.
- Some “skills” that were identified are in fact more about attitudes. See item 7. below.
- “Problem solving” is rarely mentioned, but it tends to mean different things to different people.

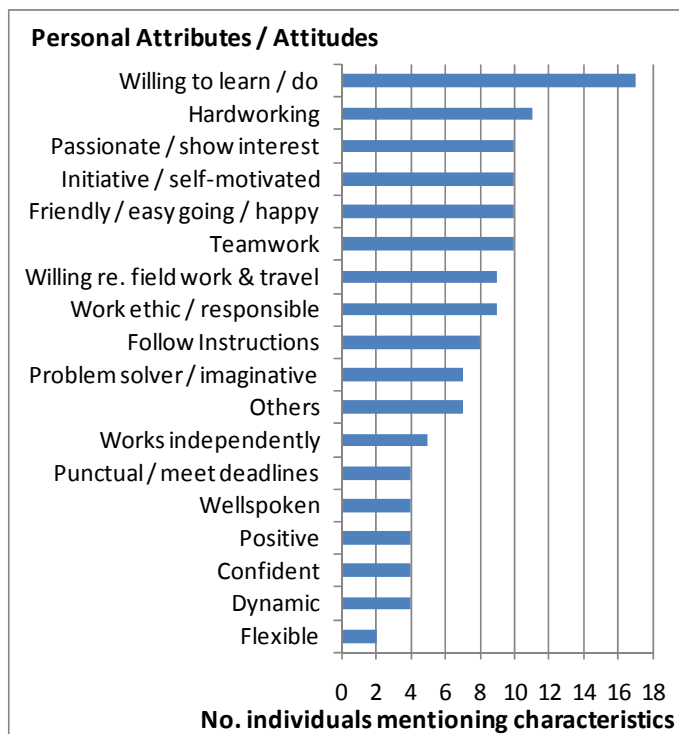




## 7. Personal attributes & attitudes

**Question Posed:** What personal attributes and attitude are you looking for in new hires?

**Comments:** Often these are more important than academic qualifications. One interviewee said “students might meet the qualifications required for a job, but they might not get the job because they project inappropriate expectations or attitudes during their interviews.”



## 8. New skills which the next generation of practitioners will need

Question posed:	No. individuals identifying each skill:	Examples of other “new” skills needed:
Please suggest 1 or 2 new skills which you expect the next generation of practitioners will need in the near future.	Computer skills	<ul style="list-style-type: none"> <li>technical Writing</li> <li>innovation</li> <li>statistics</li> <li>geophysics</li> <li>languages</li> <li>It's' going to be the same as now</li> </ul>
	Adaptability/multidiscipline	
	Data handling	
	GIS	
	Project management	
	Field skills	
	Can't think of any	
	Others	

**Comments:** These “new skills” can be taken with a grain of salt since looking into the future is challenging. Also many suggested new skills that were identified as required now in other parts of the interview. However, computer skills still seem to be the “new” skills expected for the next generation of practitioners.

## 9. Persistent shortcomings in recent bachelor level graduates

**Question posed:** Have you noticed any persistent shortcomings in recent graduates you have hired or worked with?

No. individuals identifying each shortcoming:	Examples of “other” shortcomings
No Shortcoming	<ul style="list-style-type: none"> <li>Can't finish project in time</li> <li>not specialized in software</li> <li>They are too focused on one thing, but lack knowledge in other areas</li> <li>Negative attitude causing long term damage</li> <li>analytic capability</li> <li>not good team player (they thought they were experts)</li> </ul>
Unrealistic Expectations	
Not willing to do field work or get dirty	
Others	
Writing	
Not Professional	
Lack of related experience	
Not willing to learn/adapt	

#### Comments on “shortcomings”:

- 15 individuals did not find any shortcomings in recent graduates. A few of these mentioned that they are very selective and careful when they interview their applicants.
- 10 individuals found that recent graduates have unrealistic expectations (eg “*expect entitlement prior to work experience*” and “*expect rapid advancement*”. Also “*they don't understand the concept of working hard to move up in the company*”.
- Some respondents, especially engineering consultants, complained about poor writing skills of recent graduates.
- No respondents mentioned that UBC students lack field experience. Only 1 mentioned that “lacking hands on experience” is a shortcoming for recent graduates (not necessarily from UBC). Seven respondents mentioned that “not willing to go to the field” is a consistent shortcoming among new graduates.

### 10. Questions not yielding useful information

Data from the following questions have not been presented because they did not yield useful information in this particular setting. However they might yield useful information for other disciplines.

- “*What knowledge background do you expect of the recent graduates*”: This essentially yielded “basic knowledge about the discipline we work in”. Answers to the question about impressions of UBC students suggests EOS does this well in disciplines our graduates work in.
- “*What TYPES of positions are geoscience graduates hired for*?” Answers to this are too dependent on state of the economy, the company’s maturity and focus, etc.
- “*Roughly how many employees at each level of qualification does your company hire annually*?” Answers to this are also too dependent on state of the economy, the company’s maturity and focus, etc.
- “*Is there another “degree name” that you would prefer to see on the resumes of recent graduates*?” This yields obvious answers that are very tightly coupled the specific company’s focus.

### 11. End of survey “other” comments

#### Targeting the Department:

Some respondents suggested coverage of the following topics would be beneficial to industry: i) practical field skills; ii) environmental regulations; iii) business management; iv) specific and practical field experience; v) technical writing; vi) geostatistics; vii) resource estimation; viii) mineral exploration practices such as rock & soil sampling.

#### Targeting students:

“*UBC is very progressive and thorough; should continue this tradition*”, and “*Some programs in UBC are pretty well known, eg Engineering, Geology.*”

### 12. Acknowledgements:

This project was supported by a SkyLight Development Grant<sup>10</sup> and the Carl Wieman Science Education Initiative<sup>11</sup>. We also thank Carl Wieman, Sarah Gilbert and Wendy Adams for advice regarding interview practices, and all those professionals who generously contributed time and wisdom during the Vancouver Roundup in January 2010.

<sup>10</sup> <http://www.skylight.science.ubc.ca/devgrants>

<sup>11</sup> <http://www.cwsei.ubc.ca/>

## **Appendices**

### **A1. Methodology**

The sequence of steps for completing this project were:

1. A pilot survey was conducted at a convention for geophysicists, Oct. 2009. This involved a paper handout rather than interviews. Written answers helped us choose priorities and initial questions for the interview process. Results are given in a separate report, and reproduced in appendix A3.
2. Develop a questionnaire for interviewers to use when taking notes during interviews. This is important to help produce uniform data from all interviews. However, we concluded after the project that our 2-page interview sheet was too complicated. Instead we recommend a carefully chosen set of specific questions that all interviews cover, with room for digressions and specific issues with individuals.
3. Data were collected by 4 interviewees over 3 days in January 2010. All interviewers met twice to agree on an initial protocol and to practice the process on each other. After doing several interviews, each interviewer tended to follow their own protocol that evolved based on the initial starting model.
4. Review data. This is ideally done by the interviewer on the same day as interviews were conducted to ensure all written information is legible and understandable by a third party. There are always aspects that are remembered but that did not get put on paper, and which will be completely unknown if a third party transcribes data for analysis.
5. Transcribe data from paper into a spreadsheet.
  - a. A separate row was used for each interview with each item of data (eg company name, individual's name, responses to each question, etc.) was entered into a separate column.
  - b. Some data were transcribed directly, others as "yes", "no", or a number depending on data type.
  - c. Many columns are needed. In the end data were organized into eleven worksheets in the data spreadsheet, each with related segments of the data set. In order to facilitate sorting and organizing, each worksheet including columns with interview #, Company Name, Company Type, Industry code, and Interviewee Name.
  - d. Data were organized into eleven worksheets with the following titles:  
Company Info.; Hiring Practices; Impressions of UBC; Meaning of EOS; Types of Professionals Hired; Qualities Preferred on Resumes; Key Skills; Knowledge Background; Personal Attributes; New Skills & Shortcomings; Comments on Curriculum.
6. Analysis
  - a. Companies were coded for company type as follows: a: Environmental Consultants; b: Engineering Consultants; c: Mineral Exploration/Mining; d: Geochem/Lab; e: Geophysics; f: others. This allowed all data to be sorted and analyzed by company type.
  - b. Results from each interview question were then counted for each company type and cumulative totals added up. Tables and graphs were produced as needed after all counting was done. Most counts were by *individual* but some data was more useful when counted by *company*.
  - c. Preliminary reporting involved accumulating results and writing comments on observations.
  - d. Final reporting involved converting initial results into a consistent and coherent report.
7. Results must be disseminated to all potentially interested parties, including the Department Head, students (via clubs and the Dep't website), curriculum committees, undergraduate advisors, etc.

### **A2. Questionnaire used to guide interviews**

See pages following.



FAX TO: 604-822-6088;  
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DROP BOX: UBC/MDRU booth, Tu/Wed/Th only.

## Survey of Geoscience Hiring Practices

### GOALS FOR THIS SURVEY

We aim to obtain information that will help the Department of Earth and Ocean Sciences at UBC (a) develop and maintain appropriate and stimulating curriculum, (b) advise our students regarding decisions that affect their careers, and (c) recruit students into our programs. Completing this survey should take ~10 mins.

*Information you provide is intended to improve teaching at UBC. All data will be coded so that anonymity will be protected in any form of result that will be produced from this work.*

NOTE: An on-line version can be found at <http://www.surveyfeedback.ca/surveys/wsb.dll/s/1g49a>

NAME (optional) \_\_\_\_\_ EMAIL (optional) \_\_\_\_\_

Type of Company you currently work for	Number of employees	Company Name (optional)	
Your position or work description		# yrs you have been in the company	# yrs you have been in the industry
<b>Which of the following best describes your role in hiring? (check all that apply.)</b>			
<input type="checkbox"/> You hire entry level employees			
<input type="checkbox"/> You <u>work with</u> entry level employees but <u>do not</u> hire them			
<input type="checkbox"/> You are involved in hiring senior employees			
<input type="checkbox"/> Not involved in hiring at all.			
Comments:			

### HIRING / RECRUITMENT PRACTICES

**How does your company normally recruit entry-level employees and where are job openings normally publicized?**

**What TYPES of positions are geoscience graduates hired for? 1 = Often; 2 = Occasionally; 3 = Rarely/never.**

	1	2	3		1	2	3
Field work				Business support			
Summer jobs				Sales or marketing			
Jobs for a project's duration only				Specialist technical positions			
Permanent positions expecting growth in seniority				Project or personnel management			
				Other (please specify)			

Other \_\_\_\_\_

**What specific institutions, universities or schools (e.g. preferred sources) does your company hire from, AND why?**

**Have you ever hired or worked with University of British Columbia graduates?** ☐ Yes ☐ No

If so, from what programs (if known)? \_\_\_\_\_

What are / were your impressions of those graduates?

**ROUGHLY how many employees at each level of qualification does your company hire annually?**

High School	2-yr college	B.Sc .	B.A.Sc.	M.Sc	Ph.D.

**Which types of professionals do you hire (check all that apply)**

- ☐ Geology                      ☐ Geophysics                      ☐ Oceanography                      ☐ Manage/finance/sales  
☐ Environmental **Science**    ☐ Hydro-geology                      ☐ Geological Engineering    ☐ Other Disciplines (specify)

Other \_\_\_\_\_

**Many of our students graduate with a “Major in Earth and Ocean Sciences”. What does this mean to you?**

**Is there another “degree name” that you would prefer to see on the resumes of recent graduates?**

**When assessing resumes, how interesting are the following types of qualifications? (Chose one in each row)**

1 = Very; 2 = Somewhat; 3 = Not very; dk = don't know

	1	2	3	dk
Honors degree				
Co-op workterm experience				
Relevant work experience				
“Other” work experience				
Completed APEGBC requirements				
Field experience				
A "minor" added to the "major" degree				
Research experience				
Other (pleases specify)				

***DESIRABLE SKILLS, KNOWLEDGE, AND ATTRIBUTES***

What are 2 or 3 key skills you want the recent graduates you hire to **be able to do**?

What **knowledge background** do you expect of the recent graduates you hire?

What **personal attributes or attitudes** are you looking for in a recent graduate?

Examples: >likes field (or other) work, >has a long term attitude to the business, >curiosity / interest in innovation, >etc.

Please suggest 1 or 2 **new skills which you expect the next generation of practitioners** will need in the near future:

Have you noticed any **persistent shortcomings** in recent Bachelor level graduates you have hired or worked with?

***OTHER***

Do you have any other Comments?

Is there anyone else in your company you'd recommend we talk to?

Thank you very much for your help! To see results, contact <fjones@eos.ubc.ca> in April.

### A3. Recommendations for obtaining higher quality data

Comments are listed under three headings but are not in any particular order. They are based both on aspects that worked for us and on aspects that either didn't work or which we feel in retrospect could have been included.

#### Preparation

1. Keep things short and precise. In general, long questionnaires/surveys get less response than short ones. Recall that a high response rate is an important factor for obtaining useful, believable results.
2. If quantitative results are expected, specific choices should be given. This will help speed up the data acquisition and processing.
  - a. For example, for number of years of experience we ended up using 0-4 years, 4-10 years etc. because 4 years of experience is needed to register as a P.Geo/P.Eng. This avoids answers like "many years", "I just started", "3 months".
  - b. For "Hiring Practices", choices should include Company Website; Word of Mouth/Networking; Internet Job Banks; Career Days/Job Fairs in University; Coop; Conferences; Magazines/Newspaper; Others.
3. For qualitative information such as "list new skills you expect new practitioners will need?" ask what for "the most important new skill" or the "2 or 3 most important ... etc."
  - a. For example, when asking for "2 to 3 key skills", some mentioned 6 while others noted only 1. Either is fine, but when space or time is limited (e.g. for open ended questions online) ask explicitly for the **most important 2 or 3 skills**.
4. Recognize that some respondents cannot come up with anything immediately. Some prompting might be needed (eg "What about modeling?"), but if different interviewers use different prompts the data might be skewed.
5. If prompting is going to be necessary consider including suggested prompts on the interviewer's form so that all interviewers issue the same prompts.
6. Avoid un-answerable questions such as "Is an extra Minor degree added to a Major degree interesting to you?" Often the response is "depends on what kind of Minor degree".
7. Some open-ended questions yield only very general (i.e. not very useful) comments. For example "What is your impression of UBC graduates?". Consider "what do you like most about UBC grads?" Or don't ask this.
8. We often ask "Do you have any other comments?" at the end of survey; yet over 90% of the response is "No". You may consider removing this question or asking "Do you have anything to tell our department/UBC?"
9. Prepare a transcription spreadsheet before the first data set arrives. The spreadsheet columns will no doubt change name and purpose but it helps to have somewhere to enter data without having to set it up on the first day (i.e. the first evening after the first interviews).
10. Other questions to consider introducing:
  - a. Benefits of breadth of a university degree compared to focus of a college qualification.
  - b. Benefits of exposure to the cutting edge that learning with research professors should provide.
  - c. Geochem should be added as one of the items under "Types of Professional Hired".
11. An on-line version can avoid the complex nature of data obtained from cold interviews. However, it is crucial to carry out some interviews before trying to build an online version. There are bound to be adjustments which can best be found in interview contexts. If you cannot interview actual company people, consider interviewing careers counseling personnel, colleagues who have some experience in industry, or even faculty or research colleagues. Conducting the interviews is a crucial step prior to building an online version.

### Conducting interviews

1. Smile. Even when you are doing a phone survey!
2. Write down as much information as you can.
3. In general, be careful not to give prompts. For example, for “what is the meaning of an EOS Major degree”, we found that “not specific enough” came up many times from one interviewer. If necessary use suggested prompts provided on the interview form.
4. Recording might be helpful. You do not have to listen to it afterwards, but it’s good that you keep track of your information in case you can’t write that fast or you can’t read your own writing or in case you lose the survey forms! However if managing a recording device gets in the way of having a productive discussion then leave the device at home.
5. Get interviewees’ business cards. This will save some time asking for company and personal background.
6. Sometimes responses such as “ya .....”, “sure.....” might not be a real answer. It’s a judgment call and depends on how you ask and how they answer.
7. Help respondents to elaborate their response. For example, “What are your impressions of UBC graduates?” The answers were usually “Good”, “Great” .... But these answers didn’t really help the survey. So it would be better to ask “good in what way?”
8. Start inputting/processing data within 24 hours. If it is not possible, at least read through the survey and make sure you understand what you write.

### Analysis

1. Converting interview data into quantitative information can be done in several ways. The choice will depend on convenience and experience
2. Note that some information makes sense in terms of numbers of individual responses, while other information makes more sense in terms of the number of companies not individuals.
3. We found it very useful to accumulate subtotals for each type of business. In our case companies types included: a) Environmental Consultants; b) Engineering Consultants; c) Mineral Exploration/Mining; d) Geochem/Lab; e) Geophysics; f) others.
4. Initial quick viewing of all data for a particular question may be useful to identify emergent categories. Then these categories can be identified in the spreadsheet (codes or columns) and all data can be entered as yes/no under each category, or as codes. The point is to make it easy to count frequency of occurrence. This can be done by counting 1’s, or Y’s and N’s, or using a “=countif()” spreadsheet function.
5. Actual written remarks can be entered in columns if that won’t interfere with code counting. Alternatively text can be kept in a “comments” column .
6. Extracting explicit examples of remarks can be useful for two reasons: 1) to illustrate “typical” remarks, or 2) to identify particularly revealing or insightful remarks.

### A4. Geophysics employer survey report

See pages following.





## Geophysics Curriculum Questionnaire Results

The event was the BC Geophysical Society's "Symposium: Geophysics in 3D", attended by approximately 50 people, including six academics from UBC (2 professors and ~4 students) and about 45 industry professionals, mostly (although not all) from Vancouver.

I had about 5 minutes to outline CWSEI and EOS course and curriculum reform work (no slides, just talk). This resulted in about 10 minutes of discussion, followed by handing out the one page questionnaire to everyone. This included 8 questions as follows (name was optional):

1. What is your current job description?
2. How long have you been practicing as a geoscience professional?
3. What subjects or activities from your university days have you found MOST useful?
4. Are there any subjects or activities that you feel were a waste of time?

If you were about to hire a recent B.Sc. graduate into a geophysics position...

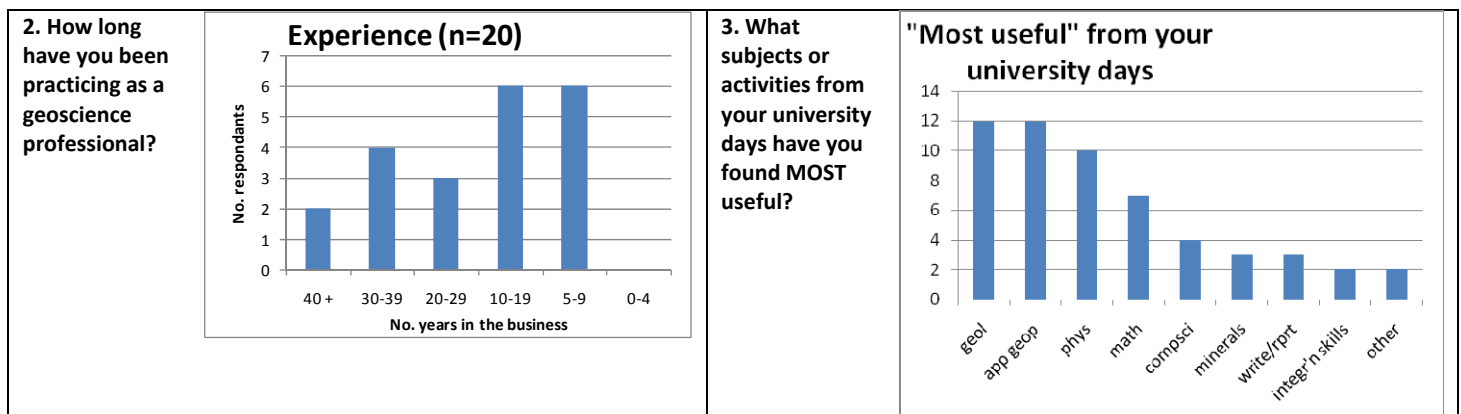
5. What technical skills and knowledge (geophysics, geology, math, computing, etc.) are currently most important? Please be as specific as possible. (Continue on reverse if needed.)
6. What general skills and knowledge (writing, business, team-working, etc) are currently most important?
7. What new skills, knowledge or abilities do you think graduates will need in the near future?
8. Do you have any other ideas about what a dynamic, flexible B.Sc. geosciences (especially geophysics) curriculum should include or look like?

Twenty one responses were obtained from the roughly 40 (non-student) attendants at the meeting, ranging from one or two word answers to a 270-word response to question 8. These people are all doing geophysics specifically for minerals exploration. There were few involved in geotechnical work, and fewer working in petroleum exploration.

Results for questions 2 through 8 are summarized after coding responses in terms of categories shown on the horizontal axis of figures. No discussion of implications is included in this summary – it only presents the data.

All ideas offered in response to question 8 (ideas for curriculum) are also listed on the last page.

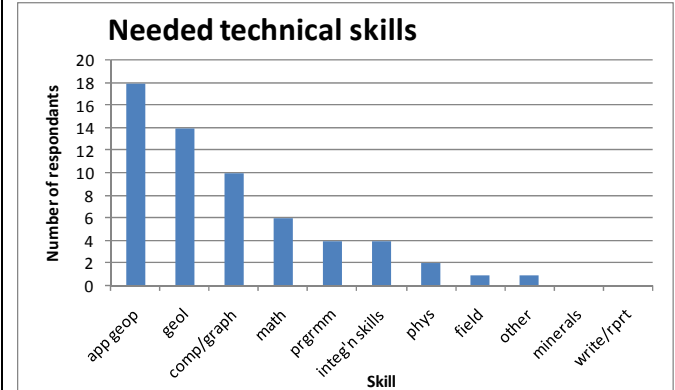
Note if there are questions or concerns about categorization or summarizing, the raw data can be provided. Please contact [fjones@eos.ubc.ca](mailto:fjones@eos.ubc.ca).



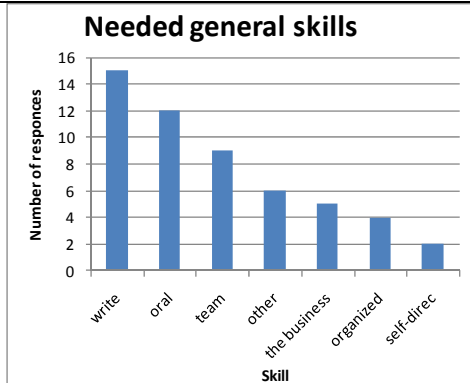
**4. What subjects or activities do you feel were a waste of time?**

- paleontology
- n-dimensional math
- some engineering courses
- paleontology, astronomy, glaciology
- modern physics
- yes, but due to bad teaching
- learning obsolete technologies, sftwr & programming languages.
- computer science introduction
- required, first yr introductory geography courses
- seismic processing, geophysics field school (better survey experience in summer jobs), optical crystallography, mineralogy, paleontology
- no, not even chemistry and world affairs -> they are all valuable
- Not particularly, however, space plasma physics as an elective was interesting, but not applicable to what I chose to do
- no, none, or blank = 9

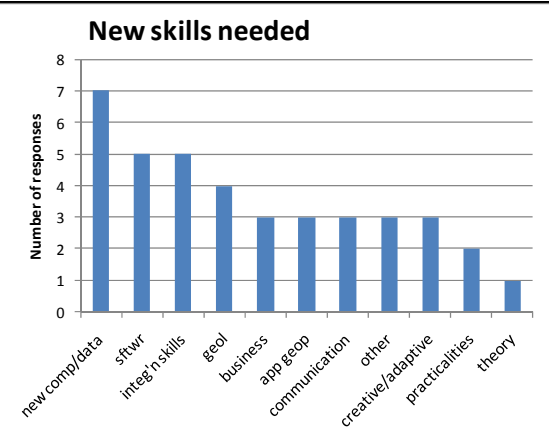
**5. What technical skills and knowledge (geophysics, geology, math, computing, etc.) are currently most important? Please be as specific as possible.**



**6. What general skills and knowledge (writing, business, team-working, etc) are currently most important?**



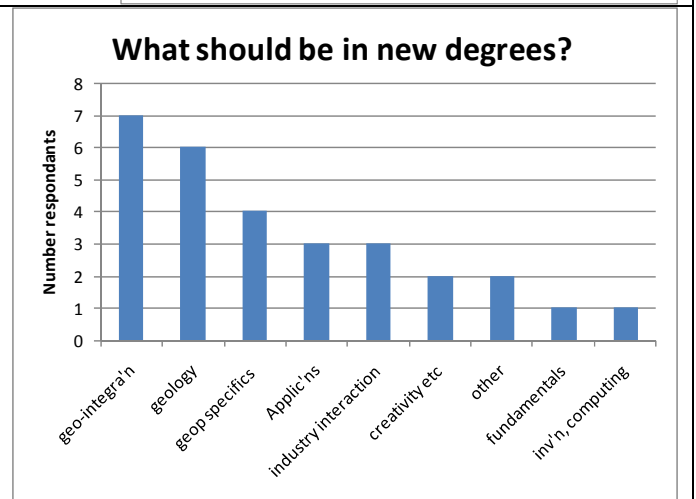
**7. What new skills, knowledge or abilities do you think graduates will need in the near future?**



**8. Do you have any other ideas about what a dynamic, flexible B.Sc. geosciences (especially geophysics) curriculum should include or look like?**

**Notes:**

- "Geo-integra'n" means integration of geoscience & exploration concepts.
- "Applic'ns" means applications – generally means providing more opportunities to practice on real data and exploration situations.





**COMPLETE Q. 8:**

**Do you have any other ideas about what a dynamic, flexible B.Sc. geosciences (especially geophysics) curriculum should include or look like?**

- I think it is important to focus on a solid background. Industry trends come and go but fundamentals remain pretty well the same.
- Conventional "university" tends to "conform". Add "creative thinking". Constrained only by wise forward thinking professors and advisors.
- More hands-on application of theory using common software (see comment), solving real world problems.
  - examples: Use publically available geophysics data to illustrate IVD, AS, TDR, RTP, etc.
  - Or invert available data like geoscience BC data and integrate with geology to develop understanding of a given area, or develop targets for followup.
- Need more up to date text books for geophysics or leading edge learning materials.
- Stress geology first, then geophysics, or at least offer this as a stream or option
- More course options for students; students need some advice for choosing major or curriculum
- no idea
- These should contain a significant portion of geology,
- specific derivation of commonly used geophysical filters (asig, AGC, hgrad, ...)
- rock property data (to be able to model a specific mineral body in all geophysical fields),
- geophysical signatures of deposits!!!)
- For a geophysicist, geology is critically important; understanding of geological processes - ore, structures.
- it needs to include geology because our patrons are geologists who need to have their geologic problems solved.
- It requires computer modelling and inversion theory given it's importance in imaging.
- more practical applications - surveying, familiarization with equipment; software use;
- correlation between geology & geophysics
- possible intro to stress modelling and fluid flow
- It should provide better integration with industry through placements / internships, etc. but we need to make it easy for companies to participate. For us now it is a resources sink as we have to educate new people.
- Co-ops. This will be easier in some areas than others.
  - For example, summer work in data acquisition is easier than trying to get useful inversion work out of someone in 2-4 months of training (unless they had a good understanding of inversion theory to begin with).
- I believe that all geophysicists should spend a good amount of time collecting data in order to gain a sense of what constitutes good vs. bad data in the real world. Data is the basis of everything else we do and graduates must know how to collect good data.
- Training of geologists in the use of geophysical tools and methods with a focus that is on the geological interpretation rather (than has been the case in the past) than on the technical / mathematical aspects.
  - Geologists in future will be using very technical applications as part of larger software packages, where a general understanding of methods will be required, when balanced with a diverse range of skills & knowledge.
- Diversity and integration - specialists are important, but diversity of knowledge and an ability to integrate multiple types / sources of information is now becoming recognized as lacking in the geoscience community.
  - University faculties have tended to perpetuate the "specialists" problem by hiring specialist faculty. Let me propose a new specialist "integration specialist".
- Core areas (computer programming, math, physics, chem, etc) should be taught in an applied way, with courses designed specifically for geoscientists.
  - For example, learning how to program in "C" for it's own sake can be uninteresting and lack purpose. However, if students are taught how to program to solve a geological problem (from say field school) then excellent / interesting / meaningful.
- There has been a tendency for a lack of integration of courses, eg structural geology, petrology, etc. are often taught independently.
  - Enhance the bridging of courses and create a system of gradual complimentary development in each subject area.
- NOTE these comments come from my own perspective from having been a student, research and teacher. I however have no specific knowledge of the state of courses at UBC, which may already address the issues above.
- BSc geosciences (mention geophysics), sub-mention minerals exploration