

EMPLOYER SURVEY 2001 of the UNDERGRADUATE PROGRAM

DEPARTMENT OF GEOLOGY AND GEOPHYSICS

INTRODUCTION

An employer survey was conducted as part of a series of surveys undertaken to meet the accreditation requirements of the Western Association of Schools and Colleges (WASC). The department had an outdated (> 10 years old) employer list of 18 Honolulu firms, some of whom had ceased operating. A new list was created from the Oahu phone book looking for geotechnical and environmental companies, as well as city, state and federal agencies. Fifty-one companies and employer organizations were identified. Some employer contact names were obtained from faculty. However, most companies were phoned to confirm the best contact person.

The Department of Geology and Geophysics (G&G) survey was adapted from the University of Hawaii at Manoa's (UHM) School of Accountancy (SOA) employer survey. The SOA's survey asked employers to first comment on the relevance of each course to the work in their field. The G&G survey listed the required courses first followed by the optional courses. The present UHM Catalog listing of courses was used for course descriptions, although in some cases, it was modified to be more employer-friendly.

The survey was divided into three parts. The first section asked for the rating of relevance of the current undergraduate courses to the employer's business, and also gave them the opportunity to suggest extra courses or modifications that they would find useful. Space was also provided for any additional comments they wished to make. The second section looked at employer hiring practices, especially with respect to G&G graduates. The third section explored the employer's interest in having a closer relationship with the Department, either through an internship program or by being notified of weekly Departmental seminars.

The survey was posted to employers on 23 August 2001, with an accompanying letter from the G&G Chair. Responses were requested by 7 September 2001. Twenty (37%) were returned as of 24 September 2001. By 31 October following a second letter, 27 returns had been received, a 53% response rate. Of the 27 returns, two companies indicated that they were unable to rate the relevance of courses to their work, as they had never employed geology graduates.

RESULTS

SECTION 1: Course relevance

Required courses	Average rating of relevance (1=low, 5=High)	No. of respondents	Ranking of relevance (1-35)
GG 101 Physical Geology #	4.24	25	6
GG 103 Geology of the Hawaiian Islands #	4.68	25	2
GG 101L Physical Geology Lab	4.24	25	6
GG 200 Geological Inquiry	2.71	21	30
GG 301 Mineralogy	3.12	25	25
GG 302 Igneous & Metamorphic Petrology	3.36	25	19
GG 303 Structural Geology	3.75	24	14
GG 304 Physics of Earth & Planets *	2.75	24	29
GG 305 Geological Field Methods	4.32	25	4
GG 308 Earth History	3.00	25	26
GG 309 Sedimentology & Stratigraphy	3.76	25	13
GG 313 Geological Data Analysis I *	3.75	24	14
GG 325 Fundamentals of Geochemistry *	3.79	24	12
GG 410 Undergraduate Seminar	3.36	22	19

Related courses: 2 semesters of calculus, chemistry and physics. (BA requires 1 semester of calculus)
1 semester of biological science

4.12	16	8
3.31	16	23

Elective courses (BA –2; BS – 3)

GG 300 Volcanology	3.83	24	10
GG 312 Geomathematics	3.33	24	22
GG 401 Introduction to Mineral Physics	2.71	24	30
GG 402 Hawaiian Geology	4.52	25	3
GG 407 Energy and Mineral Resources	2.76	25	28
GG 420 Quaternary Geology	3.52	25	17
GG 423 Marine Geology	3.80	25	11
GG 425 Environmental Geochemistry	3.92	24	9
GG 426 Sedimentary Isotope Geochemistry	2.50	24	33
GG 430 Geology & Mineral Resources of Asia	2.67	24	32
GG 444 Plate Tectonics	2.96	24	27
GG 450 Geophysical Methods	3.52	25	17
GG 451 Earthquakes	3.30	23	24
GG 454 Engineering Geology	4.32	25	4
GG 455 Hydrogeology	4.96	25	1
GG 460 Geological Remote Sensing	3.36	25	19
GG 466 Planetary Geology	2.33	24	34
GG 491 Teaching Geology	2.25	24	35
GG 499 Undergraduate Thesis	3.54	22	16

(# one of these two courses is required; * required only for B.S. graduation)

N.B. For a spreadsheet of responses see Appendix 2

From the above table it is interesting to note that three of the top eight most relevant courses to employers (those receiving a score >4.0, or relevant to very relevant) are not amongst the required courses. Though only 64% of respondents rated the preparatory science requirements, they deemed math, physics and chemistry as relevant.

In response to the question "Please list courses you think should be offered or required in a geology / geophysics undergraduate program" the following comments were obtained:

Academic courses

- ◆ Petrography of all types of rocks rather than GG302 - perhaps an expansion
- ◆ Sed & Stratigraphy, Fundamentals of geochemistry, Hydrology, Field Methods, Phys. Geology Lab
- ◆ The courses most valuable to our industry are those that deal with stratigraphy, hydrogeology and chemistry, most especially those that deal specifically with aspects of Hawaii
- ◆ Co-existing with earth hazards - sober appraisal, not knee-jerk reactions
- ◆ Geological Hazards
- ◆ Geotechnical Engineering, Hydrogeology, Groundwater Contamination, Environmental Remediation
- ◆ Geology of HI, Engineering Geology, Geology of Reef Environments
- ◆ Teach more classes geared towards the environmental field since that is where most of the jobs are
- ◆ More hydrogeology

Technical courses

- ◆ Technical writing - we find graduates very poorly prepared for writing (2)
- ◆ Oral and written (reports, applications for environmental permits) communication
- ◆ EPA regulations
- ◆ Computer Programming language
- ◆ HAZMAT course and training certificate
- ◆ Environmental sampling techniques
- ◆ GIS analysis (not just mapping) of geospatial data
- ◆ Soil classification
- ◆ Groundwater hydraulics
- ◆ Environmental laws and regulations
- ◆ Hands-on courses dealing with the practical aspects of subsurface soil and rock sampling, groundwater well installation and groundwater sampling

Field courses

- ◆ Emphasize field and not laboratory skills for the real world
- ◆ Geologic hazards course could be worked in with a field methods course

Supporting subjects

- ◆ Make sure strong math / physics background for geophysics majors
- ◆ Mathematics for modeling

The last part of this section asked employers to make any additional comments they wished to about undergraduate courses:

Technical

- ◆ A course similar to *Physical Geography* that deals with climate and environment, soils, etc
- ◆ A much stronger emphasis should be on the practical application of geology to the real world and relevant industries - engineering, construction, environmental, public health, etc
- ◆ Recommend additional courses in environmental geology
- ◆ Field methods should cover 1 year (2 semesters) and produce a geologic map
- ◆ Course in Soils or Hydrology
- ◆ Add soil mechanics as it relates to geotechnical investigations

Communication

- ◆ English grammar and writing courses should be required. As a consultant you are mainly judged on reports and 70% of your time is producing documents
- ◆ Development of effective communication skills, particularly writing, is as important as development of technical skills
- ◆ Emphasize English and writing capabilities; foreign language skills are worthwhile
- ◆ Stress writing professional engineering report

Clearly employers want graduates whose undergraduate courses have been steered towards employer needs. The employers also indicated that they can see one function of the department's is in the provision of skills or technical courses - not necessary for course credits hours but possibly for certification. Overall employers stressed the importance of practical / technical / skill-based courses that would be useful in the work situation, as well as highlighting the importance of communication skills. Some of the course recommendations can be accommodated by students taking courses in other departments. A new G&G course will address climate and environmental issues.

SECTION 2: Hiring practices

Employment of G&G graduates

In the last 3 years

- ◆ Twelve of the respondents had employed G&G graduates in the past three years
- ◆ Ten of the new recruits were from UH at Manoa and two were from UH at Hilo

In the last 10 years

- ◆ Sixteen employers had hired more than 20 graduates
- ◆ 14 employers hired UHM graduates, with 16 of the graduates coming from UH at Manoa, and one each from UH at Hilo, Colorado State and University of Utah. The balance were from unspecified mainland universities.

When asked why they had hired UHM graduates there were very few responses, but they included (i) a person who was currently employed on a temporary basis and was recommended by the supervisors and (ii) a committee rated the person the highest.

Satisfaction levels with the skills of their UHM graduate employees

- ◆ Four were very satisfied
- ◆ Ten were generally satisfied
- ◆ Two did not respond to this question
- ◆ One wrote a letter stating that as a new graduate himself he had trouble finding work, so now he has employed four UHM graduates to give them a foot in the door
- ◆ Three employers answered the question that they were generally satisfied with their UHM graduate hires even though they had not employed G&G graduates!

Aspects of the G&G program most useful to employers

- ◆ Knowledge of Hawaiian geology (5)
- ◆ Engineering geology (5)
- ◆ Hydrogeology (4)
- ◆ Computer skills / data collecting and processing (3)
- ◆ Soil identification and conditions (2)
- ◆ Field abilities (2)
- ◆ Solid fundamentals

- ◆ Good general geophysical background
- ◆ Analytical skills
- ◆ Environmental science
- ◆ Marine knowledge
- ◆ Technical writing skills
- ◆ Close relationship with geotechnical engineering

Topics that could be added to the program that would make employees more useful

- ◆ Writing classes (5)
- ◆ Communication skills (2)
- ◆ Environmental site assessments and remediation
- ◆ Environmental sampling
- ◆ Environmental geology and environmental engineering geology
- ◆ Introduction to soil mechanics
- ◆ More lab / field work / test methods
- ◆ Stronger theoretical geophysics
- ◆ Environmental processes with respect to earth systems

Job Fairs

Twelve employers indicated a willingness to participate in job fairs, two offers being conditional on location and format. Two other employers declined, one through lack of time and one because jobs are very rare in his organization.

As a summary to their evaluation, employers were asked to comment on the strengths and weaknesses of UHM graduates.

Strengths

- ◆ Well-prepared for work in Hawaii
- ◆ Knowledge of Hawaiian Geology
- ◆ Reputation for being very knowledgeable

Weaknesses

- ◆ Oral and written communication skills (5)
- ◆ Field methods (2)
- ◆ General lack of environmental science and environmental engineering (2)

- ◆ Hydrogeology skills (2)
- ◆ Less well-prepared for work in mining, petroleum or traditional fields
- ◆ More engineering courses would make students more employable
- ◆ Not enough hands-on experience in drilling and / or sampling soils and groundwater, groundwater processes e.g. pump tests, contamination transport modeling
- ◆ Teamwork attitude
- ◆ Poor at applying their knowledge to real life situations or problems

SECTION 3: Increased interaction with the Department

Internships

Employers were asked if they were interested in developing an internship program with the department. Ten responded that they were interested in discussing or starting an internship program.

Weekly seminars

The Department of Geology and Geophysics holds regular weekly seminars on a variety of topics given by a mix of faculty, visitors and students. Employers were asked if they wished to be added to the mailing list. Fifteen employers (60% of respondents) indicated they wanted to be notified.

DISCUSSION

From the responses there is clearly a lot of goodwill felt by employers towards UHM Geology and Geophysics graduates. The overall impression left by examining the responses is that the graduates make very good employees, have a good grasp of their subject area and in particular the Hawaiian geology but have some shortfalls in written and oral communication skills, and in environmental science and hydrogeology skills and knowledge.

Of the 27 responses received, two companies said they had never employed geology graduates. The revised list of 25 employers will be shared with students seeking local employment after graduation. The hiring trend by local employers suggest an increase from about one per year from 1991-1997, to four per year for the last three years.

RECOMMENDATIONS

- Develop an applied geology track to allow students to better prepare themselves for applied geology jobs
- Provide more guidance to students about courses in other departments that will provide them with skills employers want
- Include a focus of oral and written communication skills (e.g. writing-intensive)
- Develop an internship program
- Investigate the feasibility of running short courses for industry clients
- Hire an applied geologist to expand *G&G* program in environmental geology, hydrogeology and engineering geology
- When revising the Undergraduate Handbook, include the results from this survey, especially employer preferences for particular courses including those in other departments

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