November 2013 subject reports

Environmental systems and societies

Overall grade boundaries

Standard level

Grade:	1	2	3	4	5	6	7
Mark range:	0-13	14-26	27-38	39-50	51-61	62-73	74-100

Standard level internal assessment

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-7	8-14	15-19	20-24	25-29	30-34	35-42

General comments

The November 2013 session has come and gone, and during the marking of Internal Assessment (IA), Chile is in the middle of a drought and facing the worst forest fires in 25 years. Fires in Melipilla have created an air quality emergency in Santiago which has been covered in a smoke cloud. Our world continues to be challenged by environmental disasters and it is hard to imagine a future where the skills students learn carrying out practical work, will not be crucial to understanding how we generate knowledge about the environment and how we deal with the issues that will undoubtedly continue to challenge us.

The range and suitability of the work submitted

Teachers new to the subject or who are having trouble with IA work would really benefit from reading prior reports. The strengths of the programs in many schools often stem from the teacher asking students to engage in difficult, challenging laboratory and field work. Admittedly, field work can be frustrating and messy, but with good coaching in terms of the questions asked, and good use of the available terrain, students can really come to grips with the difficulties of generating good data in the field.

On the contrary weaker programs tend to suffer from simplistic tasks and skills that require direct instruction early in the program.

Candidate performance against each criterion

Planning.

The problems in this criterion are the same year to year and they tend to revolve around issues with identifying independent, dependent and controlled variables. This is not a difficult concept and so one has to wonder if the students receive the necessary instruction prior to being set a planning assessment. Another problem that plagues students is the generation of sufficient meaningful data. If a student is designing a practical on the effect of acid solutions on germination, the expectation is that they will set up five treatments, at pH 7, 6.5, 6, 5.5 and 5.0 for example, and use five repeats at each concentration. This allows the student to calculate means and standard deviations at each pH and then plot these means against pH in a scatter plot and generate a line of best fit. On the other hand if students use only two pHs and one Petri dish with five seeds in each, the most they can do is calculate the percentage of germination at each pH, and because with only two points they will necessarily have a linear relationship, the line of best fit is at best meaningless and at worst misleading.

These points have been made in previous reports and yet students continue to make the same mistakes and more importantly, achieve marks that reflect little understanding of how the scientific method allows us to generate knowledge. Teachers need to provide direct instruction on experimental design. Continued downgrading in this and other areas of the IA, should be a warning for coordinators that their teachers may require help either in the form of a workshop or by accessing teacher support material on the online curriculum centre (OCC).

Data collection and processing (DCP).

The three moderators in the November session also made numerous comments on two areas of this criterion. The most common was the loss of marks for graphing or presenting raw data, thus resulting in no marks for Aspect 2 and no marks for Aspect 3. When all students from a sample make this mistake, one can only assume that this hasn´t been adequately taught. The other issue that came up often was the inconsistent use of decimal places in both raw and processed data. This is not a trivial point, students need to understand why this is an area that has to be treated with care. When they are looking at data at some time in the future, hopefully they will be asking themselves regarding the accuracy and precision of the figures they are processing. These are very important skills if we want to produce citizens that can cope with the barrage of information that they will surely have to cope with as professionals.

Discussion, evaluation, conclusions (DEC).

The issues regarding this criterion have not changed, namely lack of depth in the discussion, lack of detail in the evaluation, and failure to follow instructions for the conclusion. The discussions must examine findings critically. Students should be encouraged to ask questions such as: “Are my data representative?” “Are my data reliable, can I trust my findings” “Why are my data tightly grouped (or widely spread)?”, “Is the calculation of a mean the best way to process my data?” To answer these questions students should naturally wonder what others have to say about the topic and this should lead to bibliographic investigation to determine if their findings are supported by other research.

The evaluation of the work allows students to reflect on the methodology they have used. They should be able to determine what went wrong or right and venture an opinion as to why. Once again many of the evaluations are reduced to descriptions of the student's contribution to the effort or their attitudes about the work. However, what is required is an analysis of why the method is strong/weak and how it can be improved. Students should not resort to imaginary equipment or fantastic solutions, i.e. "a machine that automatically seals the jars so that CO_2 is not lost upon opening. " This is akin to waving a magic wand. Solutions must be practical and within their grasp.

Finally, for the conclusion students are required to draw on their findings and explain them briefly. Most problems in this aspect are not related to wrong conclusions or misinterpretation of the data, but rather to a simple failure to follow instructions. Unfortunately this is rarely commented on by teachers.

Recommendations for the teaching of future candidates

It is always disappointing to receive samples with no teacher comments anywhere to be seen, and PSOW in which it is evident that the student has been assessed exactly twice for each criterion. Without feedback and with little opportunity to apply these skills it is hardly a wonder that some schools and students do poorly.

Teachers are strongly encouraged to enter the OCC and look at the support materials, and to read previous Subject Reports. The IB provides a lot of resources to help teachers improve their skills so that they may in turn help their students achieve success. It is a shame to see school repeating mistakes commented upon in the previous sessions.

Standard level paper one

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-6	7-12	13-20	21-25	26-29	30-34	35-45

General comments

Paper 1 was wide ranging in its coverage of the syllabus. As the maximum mark for any sub-component was 3 marks, the paper did not necessarily extend students in terms of in-depth analysis or critical evaluation which is more the focus of Paper 2. Out of the 692 candidates, marks ranged from 2 to the maximum achievable 45 marks. The mean for Nov 2013 was 22.52 compared to 23.59 for Nov 2012 session. The mean for new schools (200 candidates) was significantly lower at 19.7 marks suggesting staff training and familiarisation with the requirements of ESS course are key issues, whilst the mean for non-new schools was 23.67. Of more concern, was the low mean of 17.39 for Spanish candidates. Overall the marks achieved were considered to be a fair reflection of this cohort, which appeared to be slightly weaker than the previous year.

Overall G2 comments were highly positive. They confirmed that the level of difficulty was appropriate for an SL paper and there were no significant difference in difficulty compared to the Nov 2012 paper. G2 responses varied from fair to excellent on the clarity of wording and presentation of the paper. The majority of respondents also agreed that questions were accessible to all candidates with learning support and irrespective of religion/belief system, gender or ethnicity.

The areas of the programme and examination which appeared difficult for the candidates

- Questions involving calculations.
- Providing concise definitions.
- Providing sufficient detailed responses e.g. abiotic factors relevant to tundra or how human activities can influence the ecological footprint.
- Identifying the correct stage of the demographic transition model from data provided.
- Describing how the ecological footprint is calculated.
- Impact of global warming on disease vectors i.e. mosquitoes.
- Understanding the role of camouflage in influencing the distribution of different moths.
- Understanding the term ‘atmospheric conditions’.
- Understanding factors that influence environmental value systems of an individual.

The areas of the programme and examination in which candidates appeared well prepared

- Identifying ecological relationships and trophic levels.
- Evaluating the use of a food web as a model.
- Understanding reasons for differences in fertility rates in different countries.
- Relationship between ecological footprint and demographic transition.
- Economic benefit of controlling malaria.
- Argument for species conservation i.e. mosquitoes.
- Awareness of events that influence a change in attitudes to the environment.
- Interpretation of figures and diagrams.
- Identifying ways to control air pollution.
- Stating threats to the rainforest.

The strengths and weaknesses of the candidates in the treatment of individual questions

1(a) Many students struggled with providing a comprehensive definition of the term biome. A significant number of responses were too vague using terms such as ‘environment’ rather than ‘collection of ecosystems’ or referring to abiotic and biotic factors rather than ‘similar climatic conditions’.

1(b) Many responses were not specific enough to tundra or did not give the two correct responses required for the 1 mark.

1(c)(i) The majority of students correctly answered this question. A common mistake was not to state the type of ecological relationship between the species they named.

1(c)(ii) Most students correctly identified the trophic level as either 3 or as secondary consumer.

1(c)(iii) Most students achieved some marks for this question, which overall was well answered. Marks were often lost for being too vague and only describing a food web e.g. ‘more than 2 food chains linked together’.

2(a)(i) A significant number of students did not attempt both components of this question, which involved calculation of natural population increase and doubling time.

2(a)(ii) This question was well answered by most students. Mistakes included only providing a description of the data rather than reasons.

2(a)(iii) A minority of student correctly identified stage 3. Common incorrect answers included stage 2/4/5 and LEDC.

2(b)(i) Most students gained either ‘0’ or ‘2’marks for this question. Errors included not recognising that ecological footprint is measured by the amount of land required and not simply the amount of waste generated.

2(b)(ii) The majority of students correctly answered this question. A common error was to link a large ecological footprint to a large population.

2(b)(iii) Responses varied widely for this question. Many answered were too generalised (i.e. suggesting differences in energy differences) and often only repeated the question.

2(c) Marks achieved varied for this question, although only a minority of students achieved all 3 marks, the majority of students obtained either 1 or 2 marks. A common error was to describe possible action taken to reduce the ecological footprint rather than how this action resulted in a reduction in the ecological footprint e.g. via reduced waste that lowered the amount of land required for landfill.

3(a)(i) Most students correctly answered this question. One common error was stating ‘mutualism’ as the interaction shown in Figure 3.

3(a)(ii) This question was correctly answered by most students.

3(a)(iii) This question was generally well answered with most students achieving some marks. Errors included using mosquitoes to control human population or discussion of the use of pesticides such as DDT.

3a(iv) Most students achieved 1 out of 2 marks, the majority of whom recognised that with increasing temperature, mosquitoes may expand their distribution. Few students recognised that global warming could affect rainfall and therefore potential breeding sites for mosquitoes.

3(b) The majority of students correctly identified a major influence or an event that influenced attitudes. Popular answers included Montreal Protocol, Kyoto Protocol and the 'Inconvenient Truth' by Al Gore. However, how these identified influences had an actual impact on attitude was less well answered.

4(a) There was wide distribution of marks for this question. Common answers included lichen and various macro-invertebrate species. Good responses recognized how the indicator species demonstrated tolerance/intolerance to specific pollutants and how their abundance/absence can be indicative of the level of pollution.

4(b)(i) The majority of students correctly answered this question.

4(b)(ii) Relatively few students were able to identify the reason for differences in distribution of the two types of moths.

4(b)(iii) This question was answered well by most students.

4(c) The marks awarded were widely distributed for this question. There were a significant number of 'no responses' and a wide number of students not making any reference to atmospheric conditions in their answer.

5(a) The majority of students were able to correctly define the term climax community, although some confused it with carrying capacity.

5(b) Most students answered this question well.

5(c)(i) Responses to this question varied widely, with most students achieving some marks. A common error was to focus on ecological services such as oxygen production provided by tropical rainforest.

5(c)(ii) Most students achieved some marks for this question, although some answers did not provide a sufficient outline of the step by step process of succession to achieve full marks.

5(d) The majority of students incorrectly answered this question with many stating actual environmental value systems rather than the factors which influence them.

Recommendations and guidance for the teaching of future candidates

Students need to:

- Develop Maths skills with focus on improving student confidence and competence to deal with calculations as illustrate in question 2a.
- Be encouraged to attempt all questions within this paper.
- Directly answer the question posed focusing clearly on the command term used.
- Use past papers and markschemes to practice answering questions to a sufficient level of detail and thereby avoid generalised responses that are too vague or superficial to be credited marks.

Standard level paper two

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-7	8-15	16-20	21-28	29-36	37-44	45-65

General comments

Paper 2 includes the case-study and extended response questions assessing a wide range of skills in the context of diverse areas of the syllabus. For approximately 700 candidates, marks ranged from 2 to 57 of the maximum achievable 65 marks. The mean for Nov 2013 was considerably lower this year at 25.86 compared to 30.71 for Nov 2012 session. The mean for new schools (200 candidates) was significantly lower than other candidates at 21.98 marks suggesting staff training and familiarisation with the requirements of ESS course are key issues, whilst the mean for non-new schools was 27.49. Of more concern than in Paper 1, was the low mean of 17.17 for Spanish scripts (with a large proportion coming from new schools) which needs further investigation and monitoring. Overall, the marks achieved were considered to be a fair reflection of this cohort, which appeared to be slightly weaker than the previous year. It would seem, without firm objective evidence, that the lower score this year derived particularly from poorer performance in the extended response section of this paper.

Overall G2 comments were very positive. They confirmed that the level of difficulty was appropriate for an SL paper and at the same, or slightly higher, level of difficulty compared with last year. The great majority of G2 responses considered the clarity and presentation of the paper to be fair to excellent, and also agreed that questions were accessible to all candidates with learning support and irrespective of religion/belief system, gender or ethnicity.

The areas of the programme and examination which appeared difficult for the candidates

Graph-plotting (1ci); Linking cause-effect chains (1cii + 5a); Hypothesising (1eii + 1f); Outlining investigative strategies (2a); Human impact on nitrogen cycle (2b); Outline grasp of EIA (2c); Systems diagrams (5a); Compare & contrast (5b).

The areas of the programme and examination in which candidates appeared well prepared

Evaluation (1dii + 4c); Identifying egs of sustainability and natural income (1h + 3a); Comparing roles of IGOs & NGOs (3c); Role of plate tectonics in diversity (4a); Discussion of carrying capacity for human populations (4b); Identifying features and influences upon environmental value systems/perspectives (1hii; 4c & 5c).

The strengths and weaknesses of the candidates in the treatment of individual questions

Section A

1a i Generally good.

1a ii Generally good.

1b Generally good, but occasionally examples were too specific/repetitive such as two named rivers as inputs.

1c i Poor. A significant majority of candidates failed to use a consistent scale for axes, often just inserting data points as axis intervals.

1c ii Generally poor, providing insufficient link between human population growth and soil degradation.

1d i Calculation was rarely a problem, but often the mark was lost through not showing the working that is required by this command term.

1d ii Generally good.

1e i Generally too vague.

1e ii Generally poor as many simply attempted to transcribe useful phrases from the Resource Booklet without analysing the methodological rationale for the sampling protocol.

1e iii Generally one mark but rarely two, largely through superficial examination of data/context of the study to formulate tenable hypotheses.

1f Generally poor as many simply attempted to transcribe useful phrases from the Resource

Booklet without analysing the methodological rationale for the sampling protocol.

1g Generally OK for 1st mark, but 2nd was very rare. Again the attempt was made to gain marks by simple transcription of Resource Booklet phrases, with no new analysis of the data.

1h i Generally good. Many candidates could identify clear features of sustainability, though again, some missed credit through simply regurgitating list of actions from Resource Booklet rather than *arguing* them to be sustainable.

1h ii Generally good, with many candidates identifying key features of the more moderate value systems.

Section B

2 This was not a popular question and addressed by a small minority only.

2a Generally very poor. Candidates were able to name a technique or two, but rarely able to describe how they could be applied to measure change.

2b Generally poor. Most candidates could describe aspects of nitrogen cycle but had little to say about the less familiar perspective of human impact on that cycle.

2c Generally quite poor. Most candidates had no more than a very superficial grasp of what an EIA entails and no real idea of how it may be influenced by social context.

3 This was a fairly popular question.

3a Most could identify examples of natural income.

3b Most candidates could describe management of a protected area but had little to say about the less familiar perspective of the role played by natural income.

3c Generally good, but often responses slipped into a broad, well-rehearsed comparisons where the candidate answered their own question rather than the one on the question paper.

4 This was a very popular question.

4a Generally good.

4b Generally good, particularly at identifying exceptions for human populations. Often responses were not effectively structured to make points of comparison or contrast very explicit, however.

4c Generally good at both characterising and evaluating value systems although some evaluations were flawed as the underpinning analysis was unbalanced (ie not looking at both positive AND negative aspects).

5 This was a popular question

5a Very poor. Large majority of candidates were producing pictorial diagrams that were impressionistic and ambiguous, completely lacking the necessary precision for an effective systems/flow diagram. Furthermore, they often did not focus on the breadth of impacts required by the question.

5b Generally OK at identifying some appropriate actions for solution, but not often effectively structured to make points of comparison or contrast very explicit.

5c Generally good; often very good.

Recommendations and guidance for the teaching of future candidates

- Always show working when responding to command term, “calculate”.
- Practice in plotting ‘untidy’ data on to valid graphical models.
- Practice in applying skills and knowledge to unfamiliar data/contexts.
- Do not treat Section A questions as “wordsearch” exercises in the Resource Booklet, with copy and paste responses – candidate should apply their own analyses and structure in their response.
- Practice in structuring extended response questions to make explicit relation with terms of question, particularly in compare/contrast type questions.
- Practice in designing and giving concise description of investigative strategies and methods.
- Practice in formulating reasonable hypotheses from raw data.
- Practice in constructing precise and unambiguous systems/flow diagrams and avoiding the impressionistic pictorial diagrams that are common in textbooks, but lack the objective precision required for effective modelling of systems.