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Supplementary Material

Advanced inorganic chemistry laboratory curricula in Australian universities: investigating the major topics and approaches to learning

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Table S1 – Number of experiments per inorganic topic offered by each university (data deidentified).

University Number[a]	Class	Classical Coordination Chemistry	π-Bonding Organometallic Complexes	Physical Inorganic Chemistry	Transition Metal-Based Catalysis	Bioinorganic Chemistry	Nanoparticles, Solid State Chemistry and Extended Structures
1	**G08**	0	4	0	1	1	1
2	**G08**	3	2	6	2	1	3
3	**G08**		1	3	1	1	2
4	**G08**	1	1	1	0	1	2
5	**G08**	0	1	3	0	0	0
6	**G08**	2	0	1	2	0	1
7	**G08**	1	0	1	0	1	0
8[b]	**ATN**	0	0	0	0	0	0
9	**ATN**	2	0	3	0	0	1
10	**ATN**	1	0	1	0	0	1
11[b]	**IRU**	0	0	0	1	0	0
12[b]	**IRU**	0	0	0	0	0	0
13	**IRU**	1	2	1	0	1	0
14	**IRU**	2	0	1	0	0	0
15	**IRU**	2	0	1	0	1	0
16	**ungrouped**	0	2	0	1	1	0
17	**ungrouped**	1	0	0	1	1	2
18	**ungrouped**	0	1	0	0	0	1
19[b]	**ungrouped**	1	0	1	0	0	0

[a]Participating Universities listed in alphabetical order: Australian National University, Curtin University, Deakin University, Flinders University, Griffith University, James Cook University, La Trobe University, Macquarie University, Monash University, Queensland University of Technology, RMIT University, Swinburne University, University of Adelaide, University of Melbourne, University of New South Wales, University of Queensland, University of Sydney, University of Tasmania, Western Sydney University. [b]University offers minimal or no advanced (300 level) inorganic chemistry practical program.

The ASELL Laboratory Program Evaluation (ALPE) used in this study was adapted from the original ASELL Laboratory Program Evaluation (ALPE) (comparison of questions are shown below). The purpose of this instrument is to gain perceptions of coordinators or teachers involved in senior inorganic laboratory programs on the student experience within this program.

No	**Likert item: Student ALPE (original version)** *Note: Question number varied slightly compared to the ALPE used in this study.*	**Likert item: Academic ALPE used in this study** The laboratories completed as part of this laboratory program have helped students to…
1	The laboratories completed as part of this laboratory program have helped students to develop my data interpretation skills.	...develop their data interpretation skills.
2	These labs helped develop my lab skills.	...develop their laboratory-specific skills.
3	These labs helped me to develop my research skills.	...develop their research skills.
4	Completing these labs has increased my understanding of chemistry.	...increase their understanding of chemistry.
5	I can see the relevance of these labs to my chemistry studies.	...see the relevance of these experiences to their chemistry studies.
6	These labs enabled me to develop teamwork skills.	...develop their teamwork skills.
7	These labs enabled me to develop my communication skills (written or oral).	...develop their communication skills (written or oral).
8	These labs provided me with the opportunity to take responsibility for my own learning.	...take responsibility for their own learning.
9	These labs have increased my awareness of ethics in science.	...increase their awareness of ethics in science.
10	In general, I found the labs I studied this semester to be interesting.	In general, students communicate that they find the laboratory program interesting.
11	It was clear to me how the labs this semester were assessed.	It was clear to students how the laboratories this semester was assessed.
12	My demonstrators provided effective supervision and guidance throughout the semester.	The demonstrators provide effective supervision and guidance throughout the laboratory program.
13	Knowledge and skills I have learnt elsewhere (e.g. other course, lectures, school) have been useful in the labs I studied this semester.	Knowledge and skills students have learnt elsewhere (e.g. other course, lectures, school) has been useful in this laboratory program.
14	Overall, as a learning experience, I would rate these labs as: (A = excellent; B = good; C = average; D = poor; E = very poor)	Overall, as a learning experience I would rate the current laboratory program as… (A = excellent; B = good; C = average; D = poor; E = very poor)
Short answer questions		
15	What would you classify as the good experiments in this laboratory program? Why?	
16	What would you classify as the experiments needing most improvement in this laboratory program? Why?	
17	What aspects of the laboratory program need improvement and what changes would you suggest	
18	Please provide any additional comments about the laboratory program that you wish	

ASELL Inquiry Slider: Evaluation of the level of inquiry in this laboratory program

This part of the questionnaire evaluates the laboratory program for the estimated level of inquiry embedded in the student experience, described as the features of inquiry. For example, if there are a series of experiments where beginning activities are highly structured leading to a capstone, open-ended activity, an approximated average of these over the course of the laboratory program would be indicated.

A summary of each feature is below:

1. Learner engages in scientifically oriented questions and predictions.
2. Learner plans how to carry out investigation and collect data.
3. Learner conducts investigation, recording data.
4. Learner processes and analyses data.
5. Learner uses scientific reasoning and problem solving to link evidence to science concepts.
6. Learners communicate, and justify findings based on evidence and scientific reasoning.

Full descriptions are shown in the table below.

Table S2. Details of the ASELL Inquiry slide used to evaluate the level of inquiry

	Demonstrated Inquiry	**Prescribed Inquiry**	**Structured Inquiry**	**Guided Inquiry**	**Open Inquiry**
Questions and predictions	No question	Teacher provides question	Learner sharpens question	Learner selects question	Learner poses question
Plans investigations	No planning	Teacher provides procedure	Teacher discusses possible plans	Learner guided while planning	Learner determines plans
Conducts investigations	Teacher conducts	Learner told how to conduct and record	Learner sharpens plan and conducts	Learner guided while planning	Learner determines plans
Processes and analyses	Teacher analyses	Learner told how to analyse data	Teacher discusses possible analyses	Learner guided in analysis	Learner analyses data identifying trends
Problem solving	No problem solving	Teacher provides reasoning and links	Teacher discusses reasoning and conclusion	Learner guided in reasoning to formulate conclusion	Learner reasons to formulate conclusions
Communicates and justifies conclusions	No conclusion	Teacher writes conclusion	Learner writes conclusion	Learner guided on justifying findings and communicating	Learner justifies findings and communicates

All responses are shown in Figure S1.

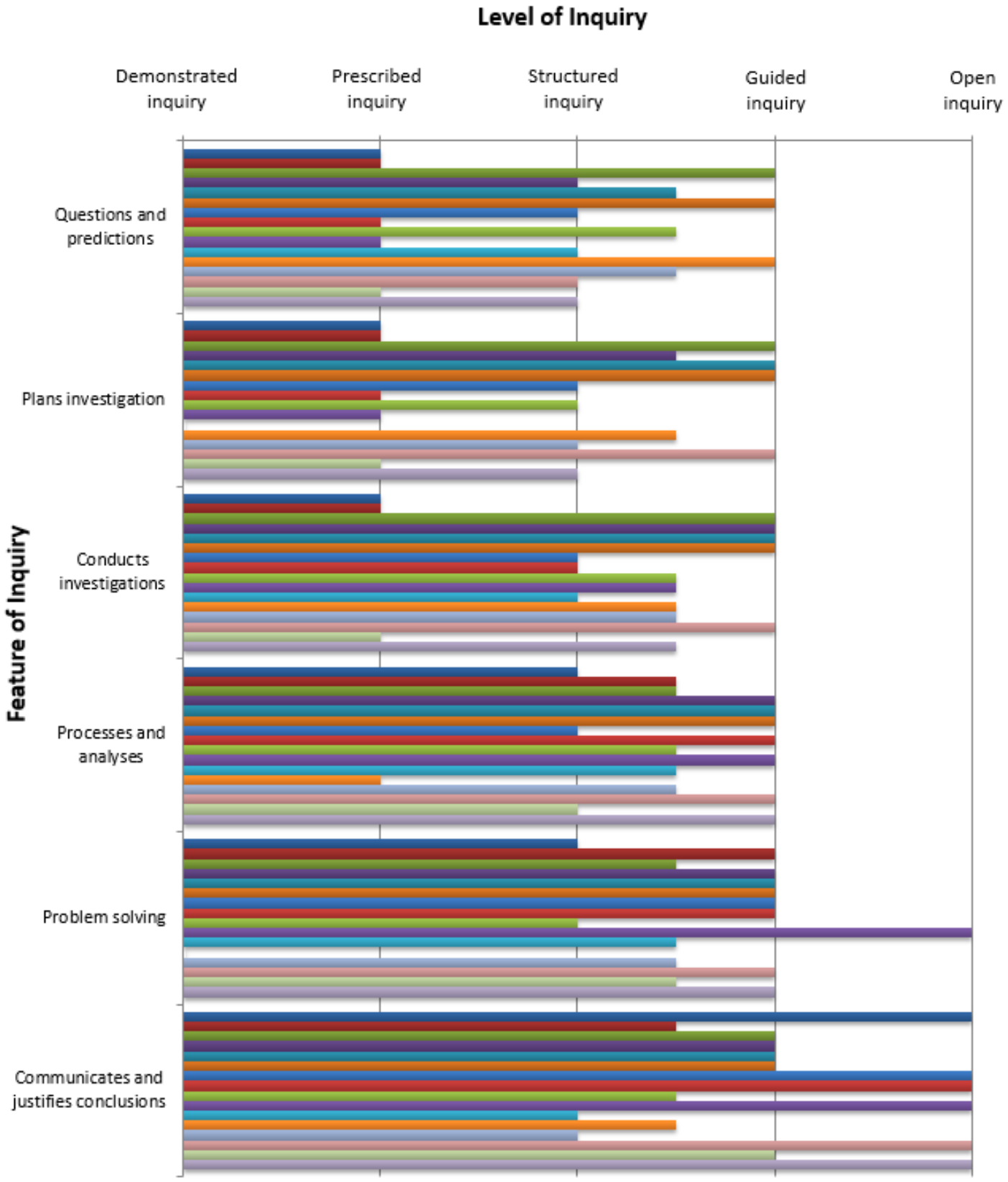

Figure S1. All responses for the ASELL Inquiry Slider.