AILO

All Ireland Linguistics Olympiad

*The Problem Solvers' Challenge*

# Evaluation of the AILO Programme 2017/8

Engaging Content
Engaging People

Problem-Solving Initiative

Science Foundation Ireland sfi For what's next

An Roinn Cultúir, Oidhreachta agus Gaeltachta
Department of Culture, Heritage and the Gaeltacht

**Executive Summary**

The Education and Public Engagement programme of the ADAPT Centre for Digital Content Technology aims to empower the Irish public to engage fully in our rapidly-evolving digital landscape and to foster an interest in, knowledge of, and appreciation for the emerging technologies driving change in digital media and technology.

ADAPT has identified 'collaborative and creative problem-solving' as a key skillset to leverage digital media innovations and to enhance how we interact with future digital media and information. The ADAPT EPE Education strand aims for Second level Education are:

- Enhance students' problem-solving skills and increase their confidence in tackling complex problems.
- Ensure that talented young problem-solvers see clear links between their love of problem solving and STEM career pathways.

1. In the second half of 2017 ADAPT conducted a study on how the AILO learning outcomes align with the Junior Certificate (JC) Programme (ages 13-16 years old) and with the OECD PISA (2012/2015) collaborative and creative problem-solving competencies. This work fed into the design of the materials for the 2017/8 season of the ADAPT All Ireland Linguistics Olympiad (AILO) which ran from September 2017 until August 2018. This evaluation report focuses on the resulting interactions that were evaluated:

- AILO Problem-solving Workshops Nov 2017 – Jan 2018

Twenty workshops, attended by 546 students and their teachers from 42 schools, were run by ADAPT tutors held in 13 counties all over the island of Ireland. The workshops were evaluated through attendee pre- and post-event questionnaires.

- AILO National Final March 2018

The top 100 students from the preliminary qualifying round were invited to the National Final of AILO Tuesday 13th March in Dublin Institute of Technology Grangegorman. The event was evaluated through an attendee post-event question. An initial assessment of problem-solving skill was carried out on a pilot basis at the National Final.

Overall feedback indicated that the workshops and AILO National Final were well-received, well-organised and that participants would recommend AILO events to others. The key outcomes from the evaluation were:

- Participants reported improved confidence in their problem-solving skills as they continued through the programme.
- Participants reported improved effectiveness in tackling complex problems.
- Participants reported an improved propensity to study computing, languages or linguistics at third level as they continued through the programme.
- Those that attended workshops were more likely to reach the AILO National Final and tackle the new bonus marks assessment questions (using tables / graphs to help write clear and concise rules).
- Participants reported improved skills they can use in other aspects of the lives.

This evaluation has led to changes for the 2019 AILO Programme such as a new Teaching Materials 2019 Pack to empower teachers to run workshops themselves, now that it is a more established programme.

The appetite for workshops and practice materials in the 2018 programme led to the creation of new monthly sample puzzles and new Autumn 2018/9 problem-solving workshop programme with thanks to Department of Culture, Arts and Heritage (DAHG) funding. In order to track how many teachers / students are using the materials, the AILO website now tracks downloads and there is a short survey on use.

With the move to further assess students' ability to analyse and present data clearly, the 2019 Preliminary Round will be extended to also award marks for analysing and writing rules. This will allow a wider view of the skill-set with 1400 secondary school students taking the preliminary round. A pre- and post-survey of these students will also be carried out.

Finally, in order to the understand the longer-term impacts of the AILO programme a longitudinal study of AILO Students will begin in 2019.

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## 1. AILO Overview

The All Ireland Linguistics Olympiad (AILO) is the problem solvers' challenge. The national contest sees secondary school students develop their own strategies for solving complex problems in unfamiliar languages from around the globe. No prior knowledge of linguistics or foreign languages is required. Even the hardest problems require only logical ability, patient work and a willingness to think around corners.

AILO introduces students to the application of logic and linguistics to problems of language understanding and translation. The goal is to develop students' problem-solving skills, improve confidence and to inspire them to consider the fascinating range of careers at the intersection of computing, language and linguistics.

AILO is run by The ADAPT Centre for Digital Content Technology (www.adaptcentre.ie). ADAPT is a multidisciplinary academia-industry research centre funded by Science Foundation Ireland (SFI) and comprising 150 researchers at Trinity College Dublin, Dublin City University, University College Dublin and Technological University Dublin.

Each year, approximately 4,000 secondary school students, North and South, register for AILO to receive monthly sample puzzles. Students are then invited to free regional workshops held all over the island. Approximately 1,400 students take the preliminary round in their own schools each year in February and the top 100 are invited to the National Final in March in an ADAPT university. The top four problem-solvers go on to represent Ireland at the International Linguistics Olympiad (IOL) each Summer, bringing home bronze medals in the past.

## 2. Background

The Programme for International Student Assessment – PISA 2012 (OECD, 2014) ranked Ireland's 15-year olds at 22nd of 44 countries in computer-based problem solving. This mediocre performance suggests that Ireland needs to act to improve the human capacity of its future workforce in problem solving.

ADAPT has identified 'collaborative and creative problem-solving' (OECD, 2017) as a key skillset to help secondary school students to leverage digital media innovations and to enhance how we interact with future digital media and information. The changing nature of the future of jobs highlights a need for core transferable skills like adaptability and problem solving. The OECD, for example, in explaining its focus on assessing students' problem-solving skills across the globe, explains that: "Schools need to prepare students for change that is more rapid than ever before, for jobs that have not yet been created, for societal challenges that we can't yet imagine, and for technologies that have not yet been created." The World Economic Forum's Future of Jobs Report (WEF, 2016) report states that: "65% of children entering primary school today will ultimately end up working in completely new job types that don't yet exist."

While student views of problem-solving ability were assessed in the AILO programme in 2016, an analysis of student problem-solving skills was carried out after the National Final in 2017. This showed that while AILO students were able to see patterns and trends in complex puzzles, improvement was needed in representing those ideas clearly and accurately.

Learning outcomes for what students should be able to do after each round of AILO were set out and compared with the OECD PISA (2012/2015) collaborative and creative problem-solving competencies (Appendix D).

This was followed by an analysis of how the AILO learning outcomes support the Junior Certificate (JC) Programme (ages 13-16 years old). Specifically, the learning outcomes were matched against the following elements and are available in Appendices E and F.

a. Junior Certificate Key Skills
b. Junior Certificate Statements of Learning (SoL)
c. Maths / Coding curricula

These outputs fed into the design of the 2017/8 workshops and materials.

## 3. Overview of AILO 2017/8 Statistics

| AILO Problem Solving Olympiad Workshops 2017 | No. | Information |
|---|---|---|
| Registered & received sample puzzles - students | 4471 | 193 schools in 32 counties |
| Registered & received sample puzzles - teachers | 136 | |
| Number of students from disadvantaged schools registered | 533 | From 27 schools |
| Regional Workshops Student Attendance | 546 | 20 workshops held in 13 counties (42 schools from 18 counties) |
| Low STEM-engagement counties | 7 | 7/8 counties acted as hosts for workshops |
| Teachers at workshops | 25 | |
| ADAPT Regional Workshop tutors | 13 | |
| Round One 57% female, 43% male | 1350 | from 32 counties (30% of Partic. Round)<br>(34% had attended a workshop) |
| Round Two 60% male, 40% female | 100 | (59% had attended a workshop) |
| International Linguistics Olympiad (IOL) level | 5 | 5 students represented Ireland at the IOL in Prague in July 2018. |

## 4. The 2017/8 Workshop Programme Overview

The new 2017/8 workshop design covered:

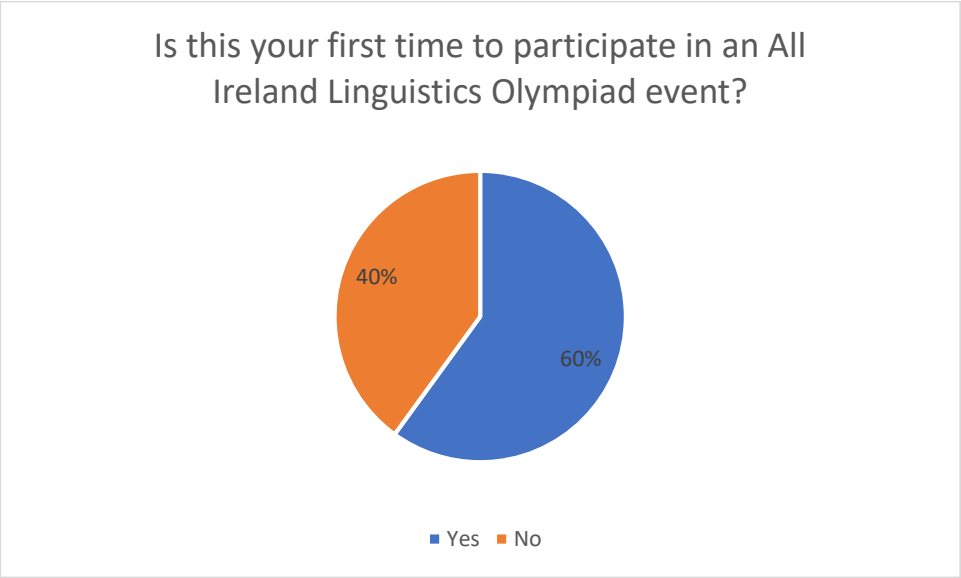
- ADAPT researcher education and career background
- Why problem-solving skills are important
- Introductory logic puzzles
- Introduction to AILO & problem-types
- How to analyse data and tools to use (e.g. tables, graphs, colours)
- How to explore ideas and alternatives, how to find patterns.
- How to write clear and concise rules to describe your findings
- Practice with a preliminary round puzzle
- Practice with a National Final round puzzle

Puzzles and workshops can be found at https://ailo.adaptcentre.ie/sample-puzzles/.

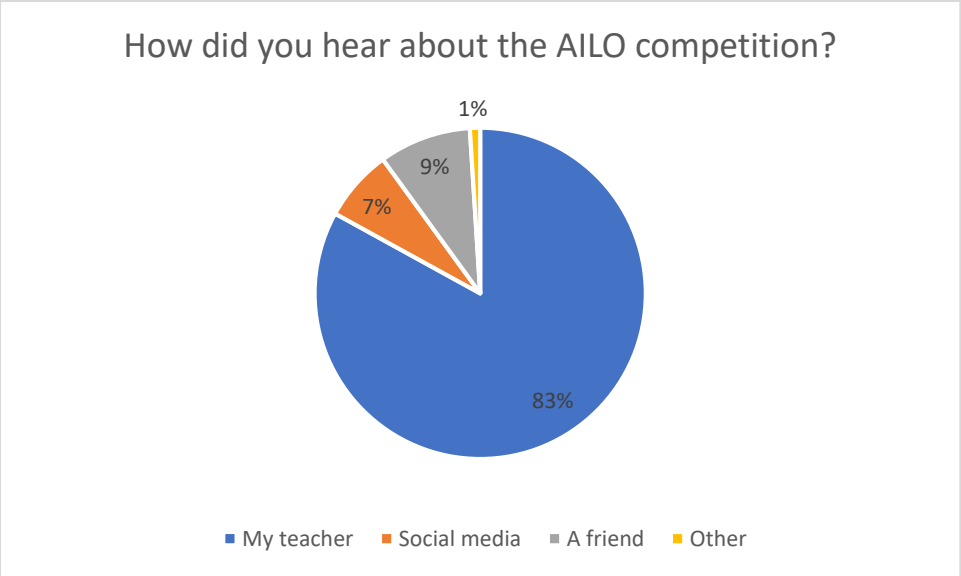
## 5. November 2017 – January 2018 Pre-Workshop Survey Results

Respondents: 357, survey in Appendix A.

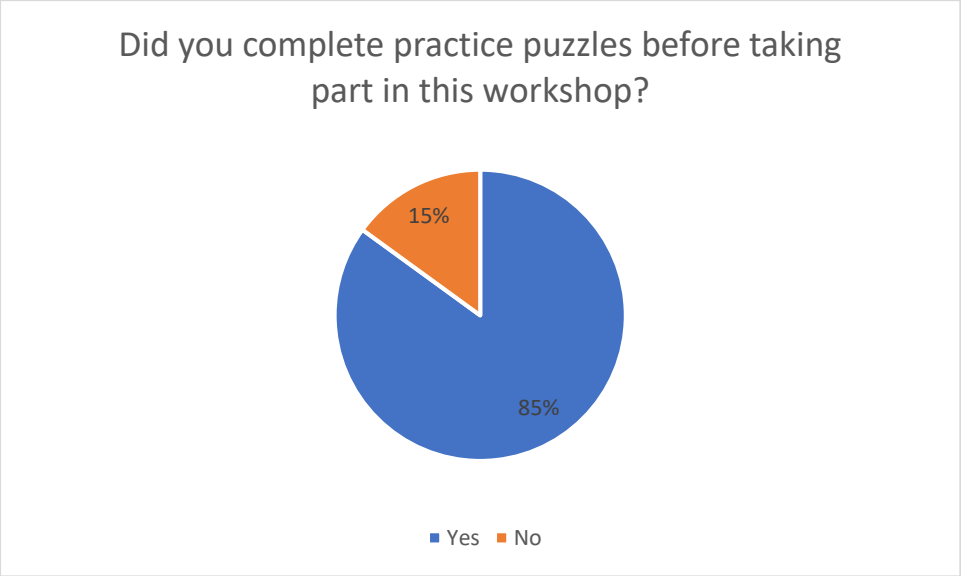
Q1.



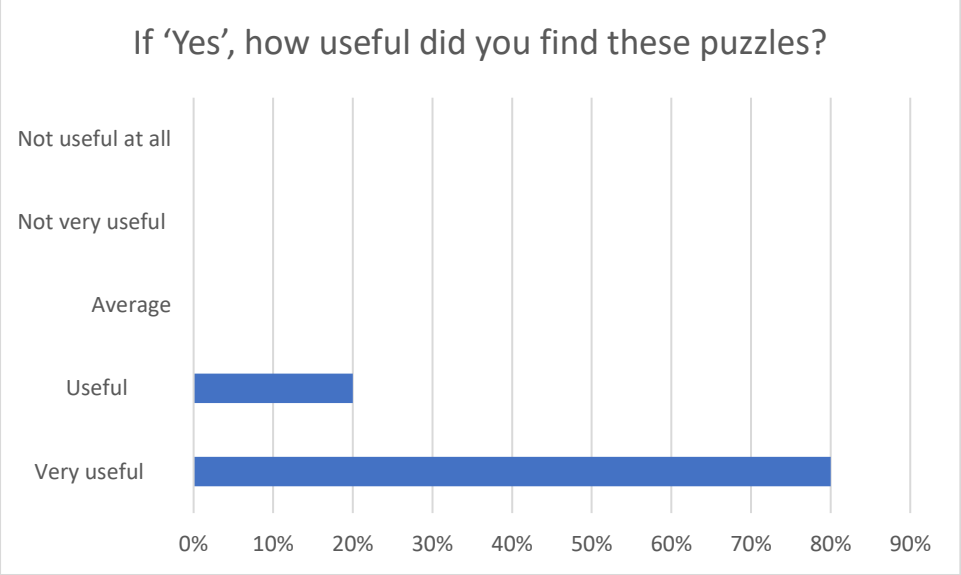

Q2.



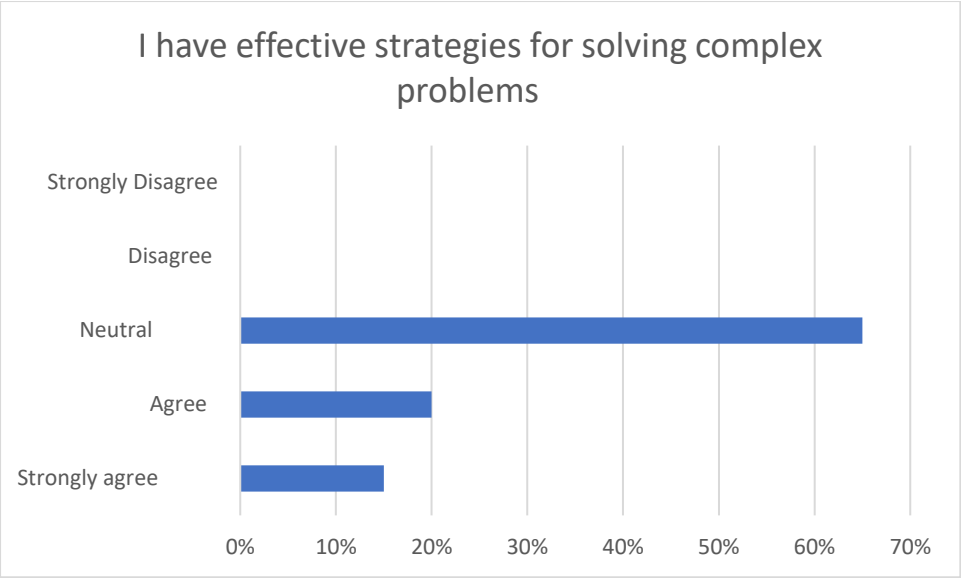
Q3a.

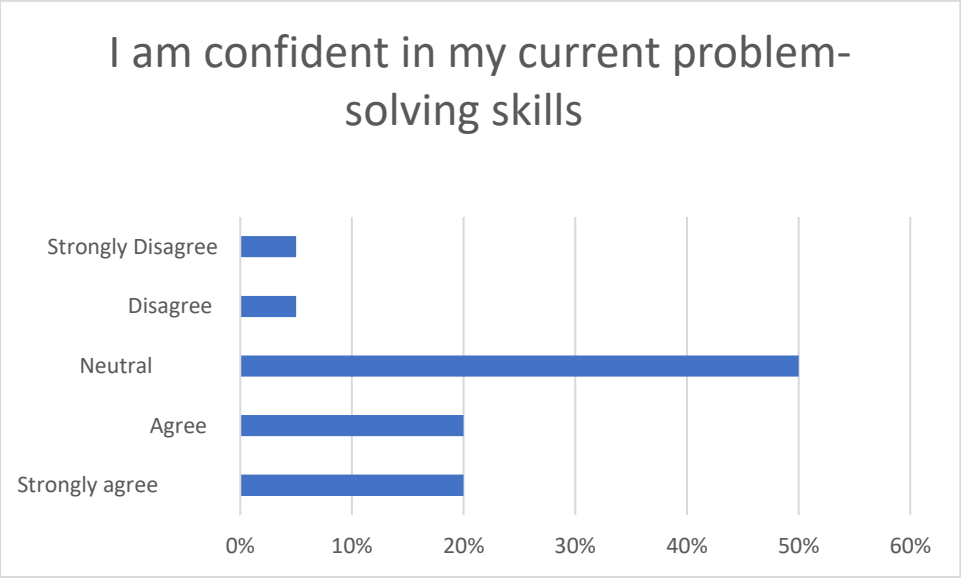

Did you complete practice puzzles before taking part in this workshop?
15%
85%
Yes
No

Q3b.

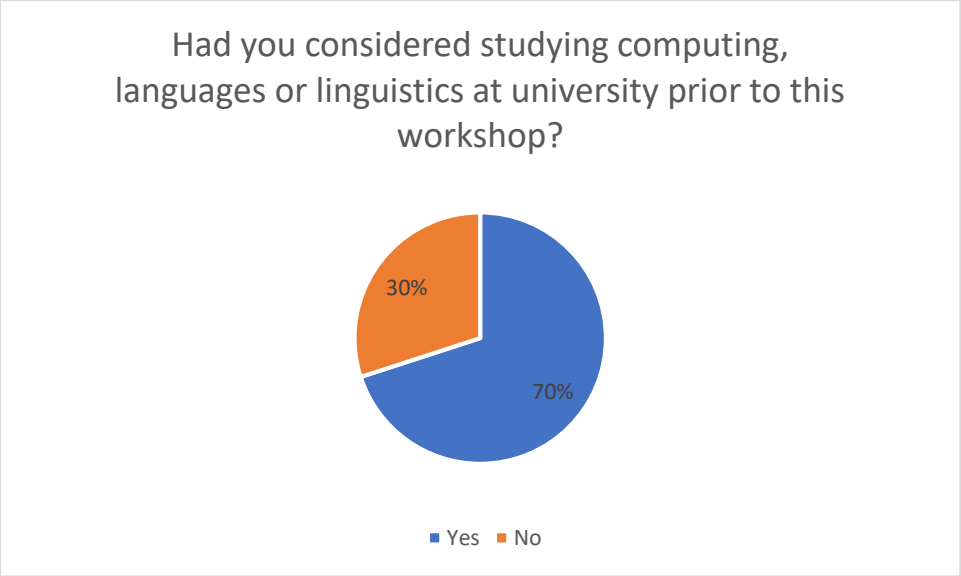

If 'Yes', how useful did you find these puzzles?
Not useful at all
Not very useful
Average
Useful
Very useful
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%

Q4. How much do you agree / disagree with the following statements? (please circle)



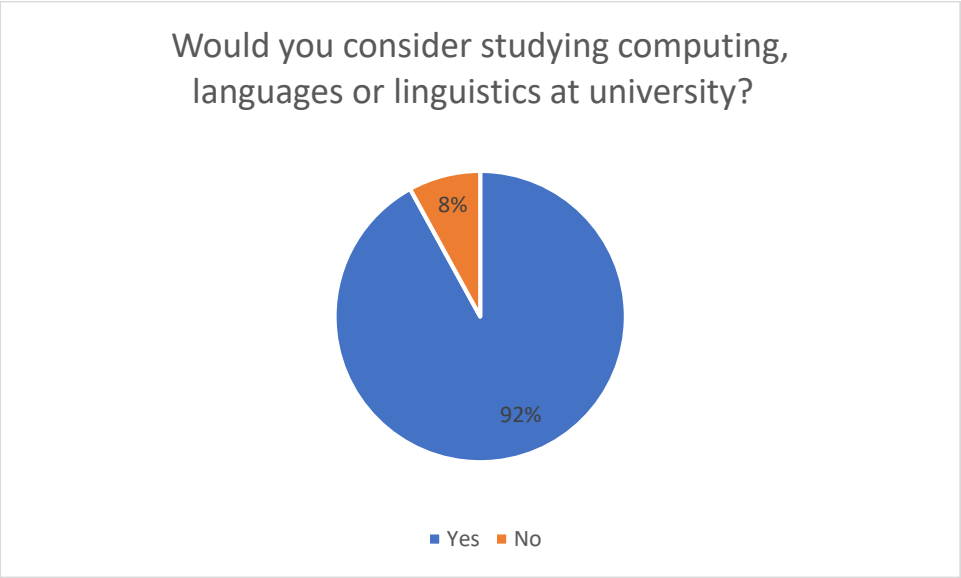
Q5.


Had you considered studying computing, languages or linguistics at university prior to this workshop?
30%
70%
Yes
No

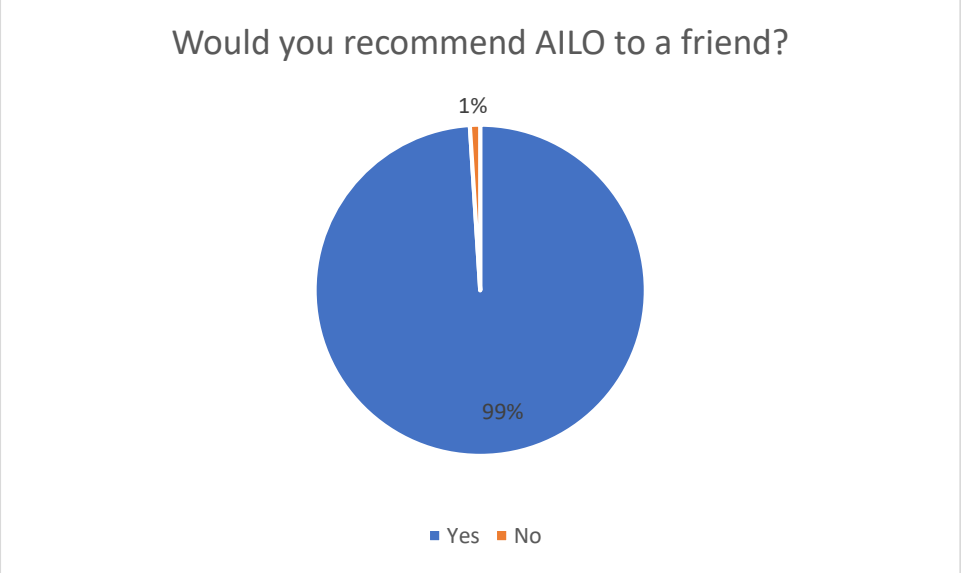
## 6. November 2017 – January 2018 Post-Workshop Survey Results

Respondents: 412, survey in Appendix B.

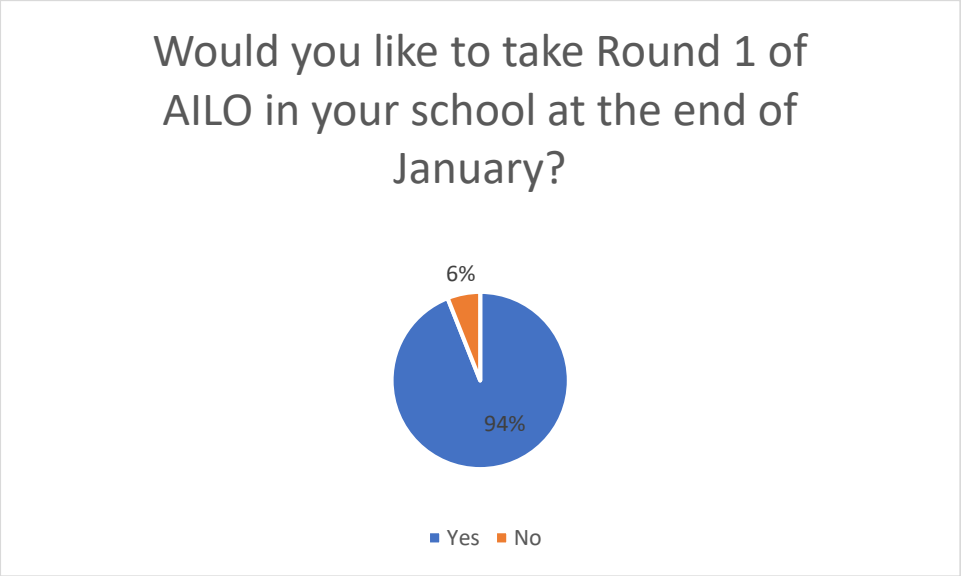
Q1.



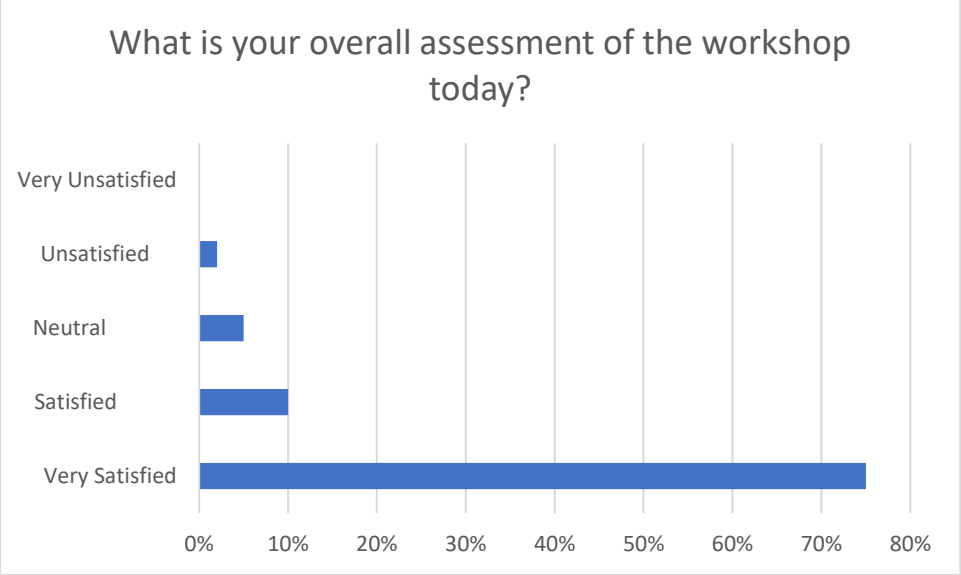

Q2.



Q3.



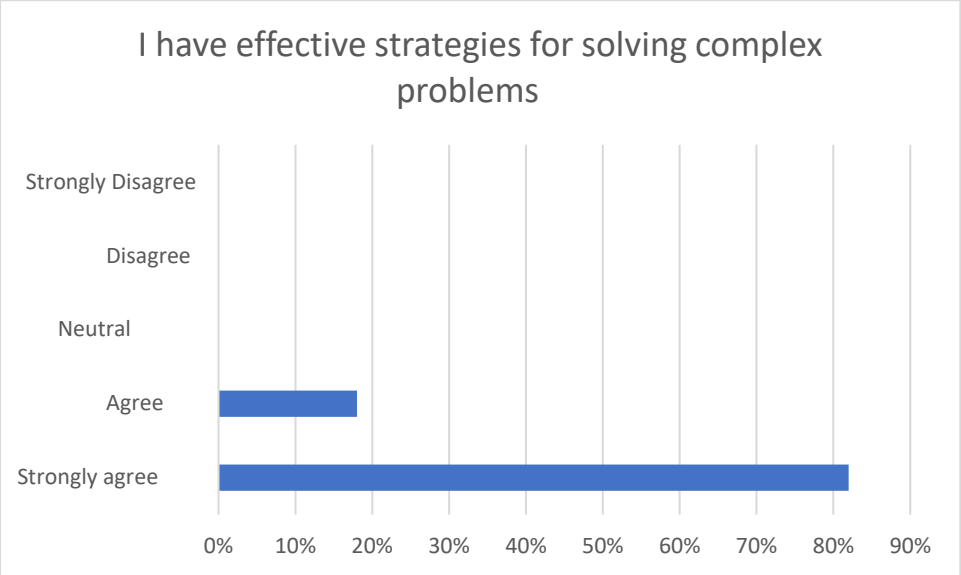

Q4.

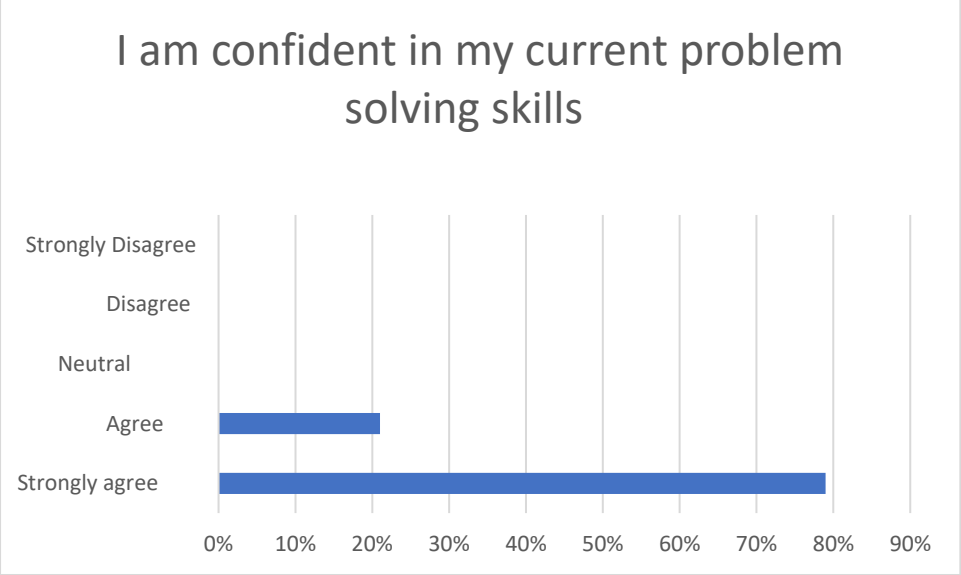


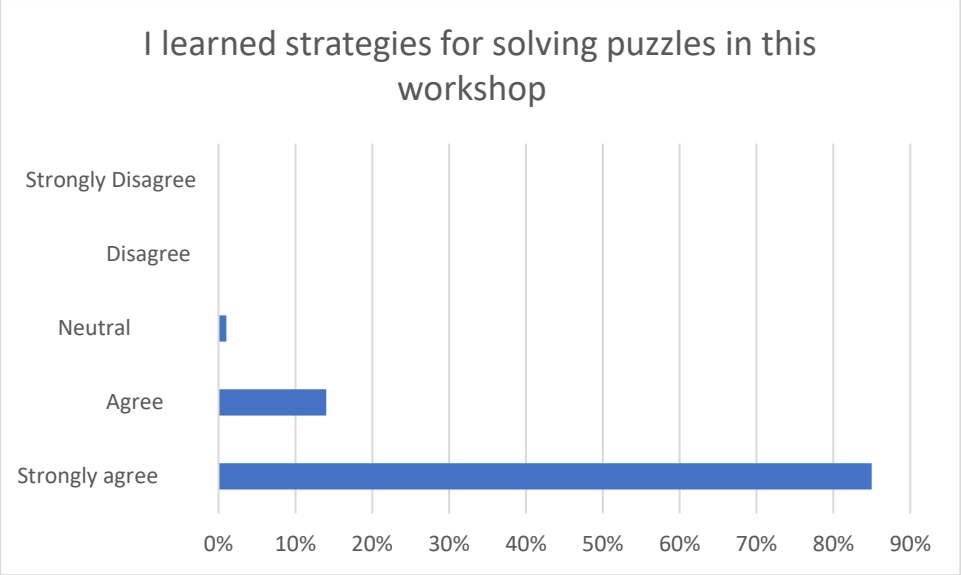

Q5.

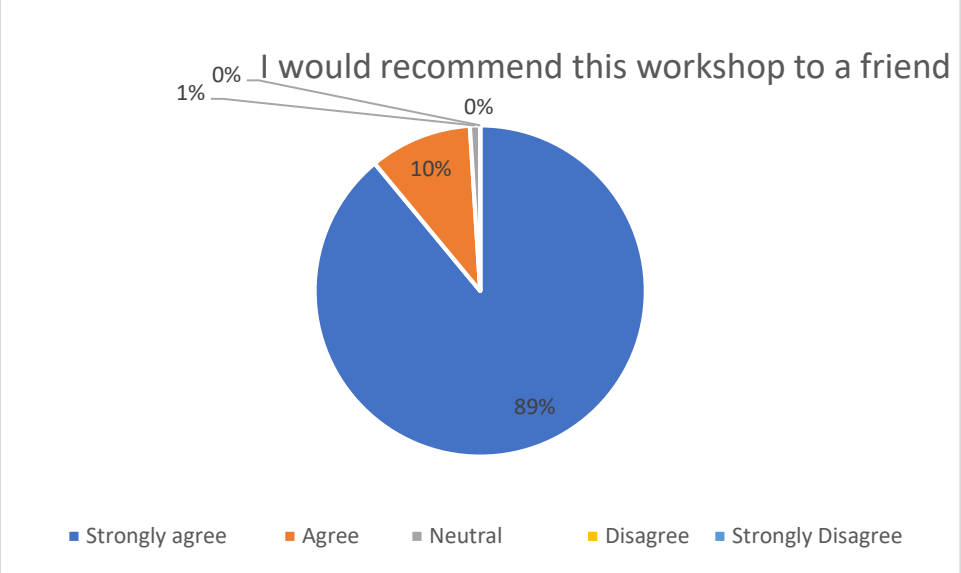
| What topics or aspects of this workshop did you find most interesting / useful? |
| --- |
| Trying puzzles, named a specific puzzle, strategy, how to write rules, puzzle types, how to know which puzzles to do tables / graphs for. |

Q6. How much do you agree / disagree with the following statements? (please circle)






| Comments / Feedback |
| --- |
| Would like more time on trying more puzzles.<br>Really great workshop, thanks<br>Thanks for extra puzzles<br>More time on puzzle-types<br>Methods, linking languages, strategies, relations between languages.<br><br>Thank you, it was really interesting<br><br>It's a great feeling when you solve the problems! |

## 7. Learnings from the Nov 2017 – Jan 2018 Workshop Survey Results

It is clear from the pre-workshop survey that the sample puzzles from the AILO are being accessed with 85% of respondents reporting that they had tried sample puzzles prior to the workshop. The comments from the workshop were very positive and had a recommendation for more time in the workshop. 75% said they were "very satisfied" with the workshop and 95% stated they intended to take the preliminary round of AILO in their schools.

- Improved confidence in problem-solving skills

The surveys show that participants reported increased confidence in their problem-solving skills. In the pre-workshop survey, 20% "strongly agreed" that they had confidence in their problem-solving. This improved to 79% post-workshop.

- Improved effectiveness in tackling complex problems.

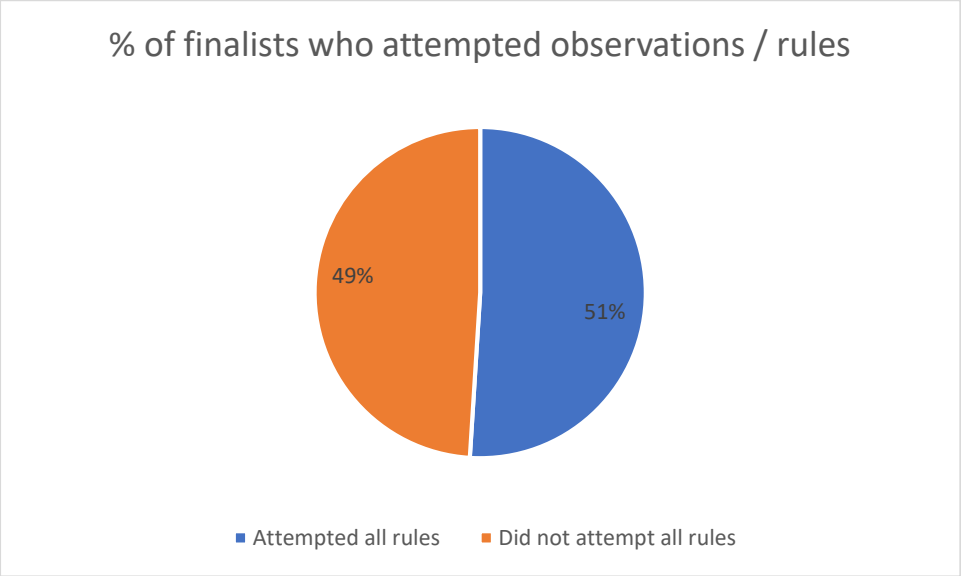
The surveys show that participants reported improved effectiveness in tackling complex problems. In the pre-workshop survey, 15% of respondents "strongly agreed" that they had effective strategies for solving complex problems. This improved to 82% post-workshop. 59% of qualifiers for the 2018 National Final had done a workshop.

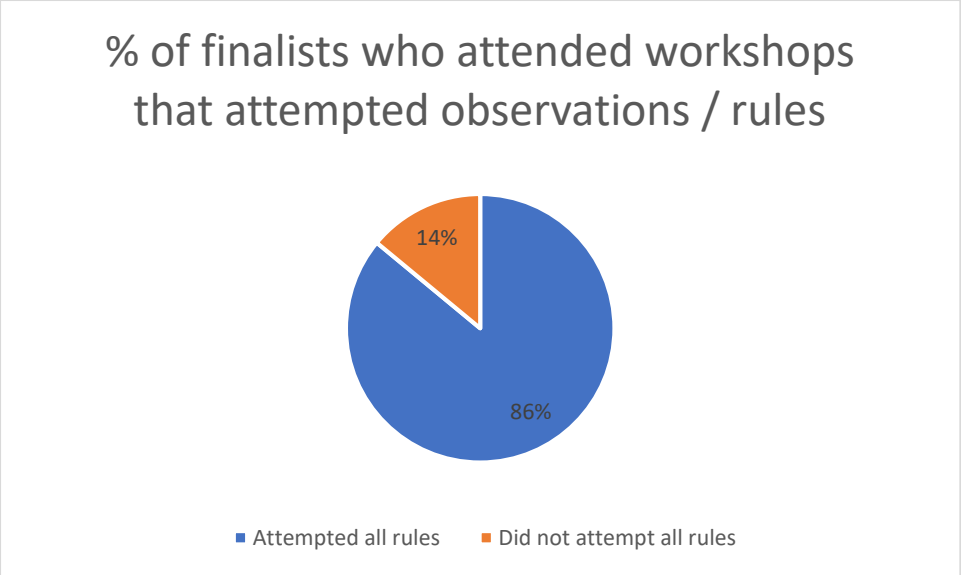
- Participants reported an improved propensity to study computing, languages or linguistics at third level as they continued through the programme.

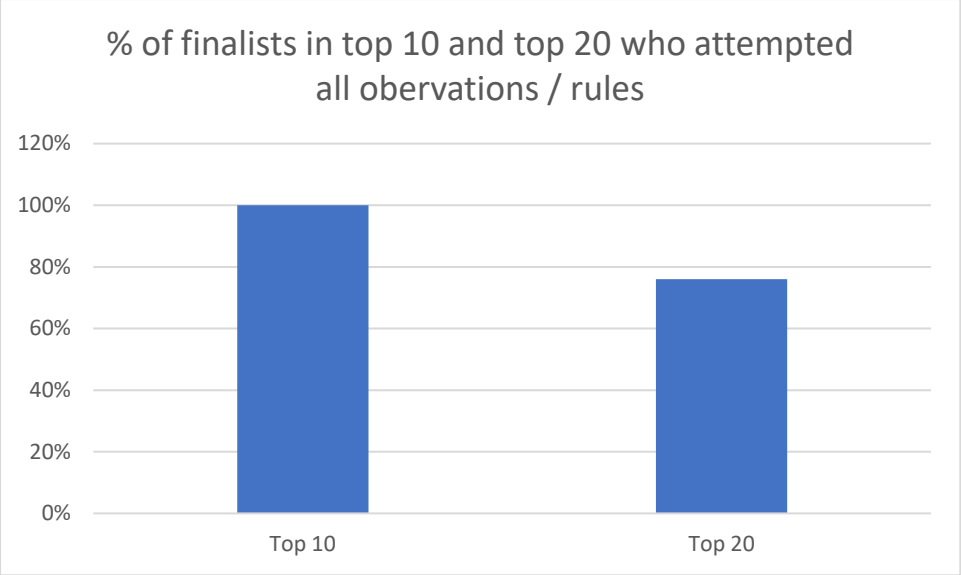
70% of respondents in the pre-workshop survey reported that they had considered studying computing, languages or linguistics at university. This improved to 92% post workshop.

## 8. March 2018 National Final – Marks for Writing Rules

Assessment of rules and observations was introduced for the first time at the AILO National Final 2018. In the five questions over two hours, 33% of marks were awarded on top of correct answers. In order to write these clear and concise rules, tables and graphics would have to be used correctly.



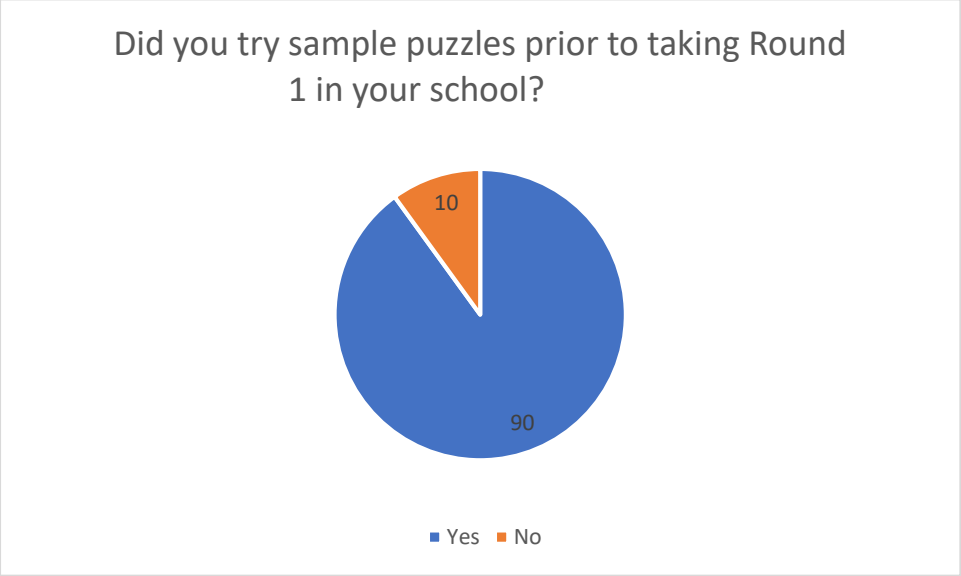



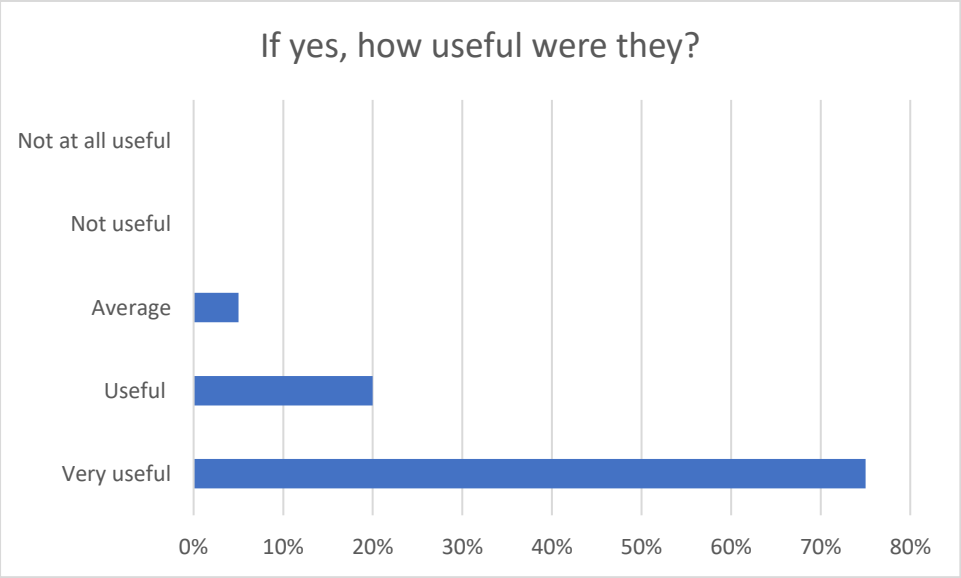

% of finalists in top 10 and top 20 who attempted all obervations / rules
120%
100%
80%
60%
40%
20%
0%
Top 10
Top 20

## 9. March 2018 Post National Final Survey Results

Respondents: 100, survey in Appendix C.

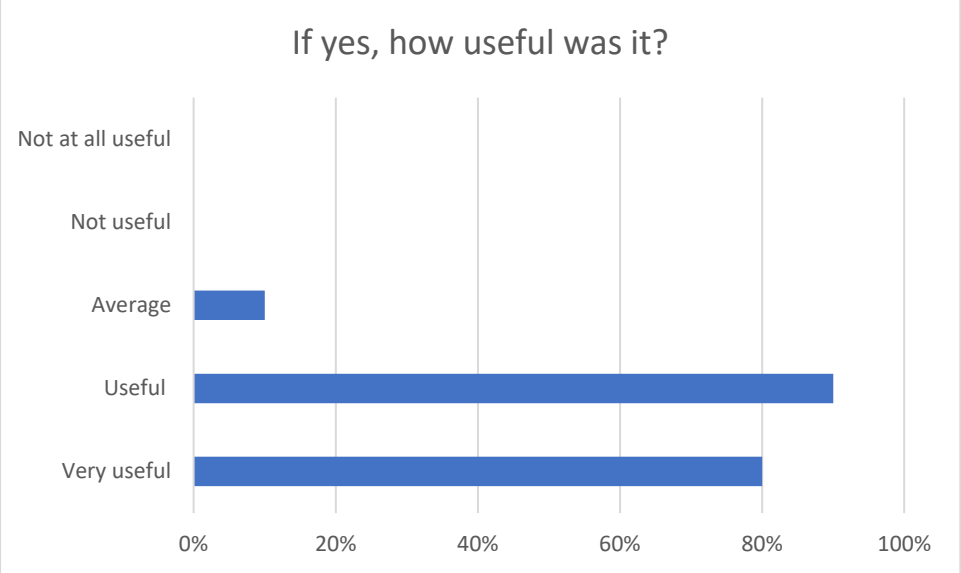
Q1.



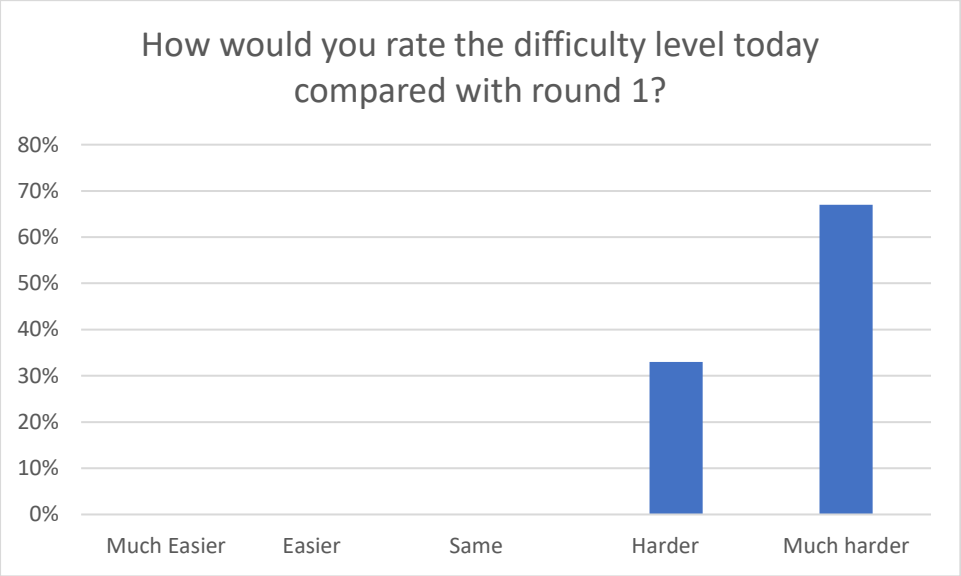



Q2.

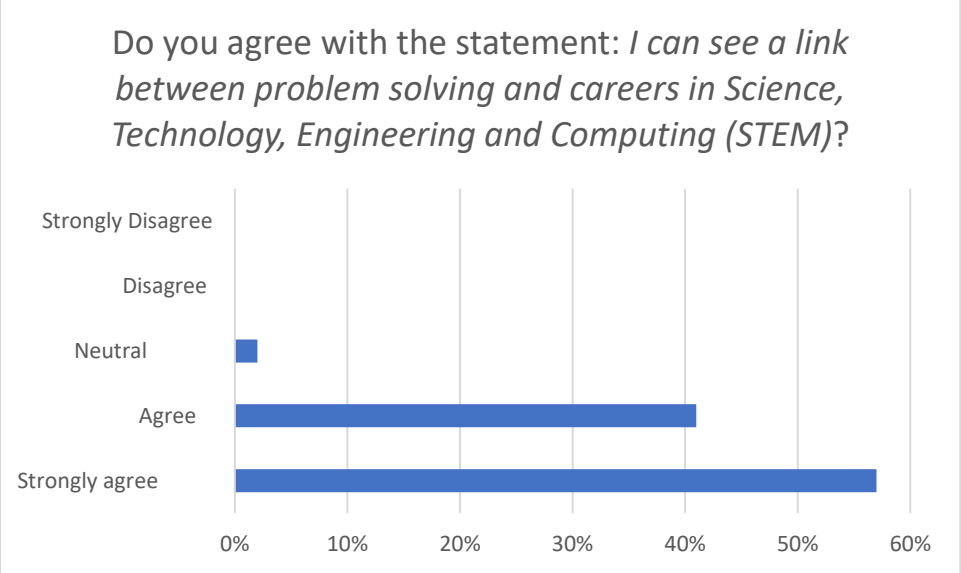
Did you attend a workshop?
41%
59%
Yes
No


If yes, how useful was it?
Not at all useful
Not useful
Average
Useful
Very useful
0%
20%
40%
60%
80%
100%

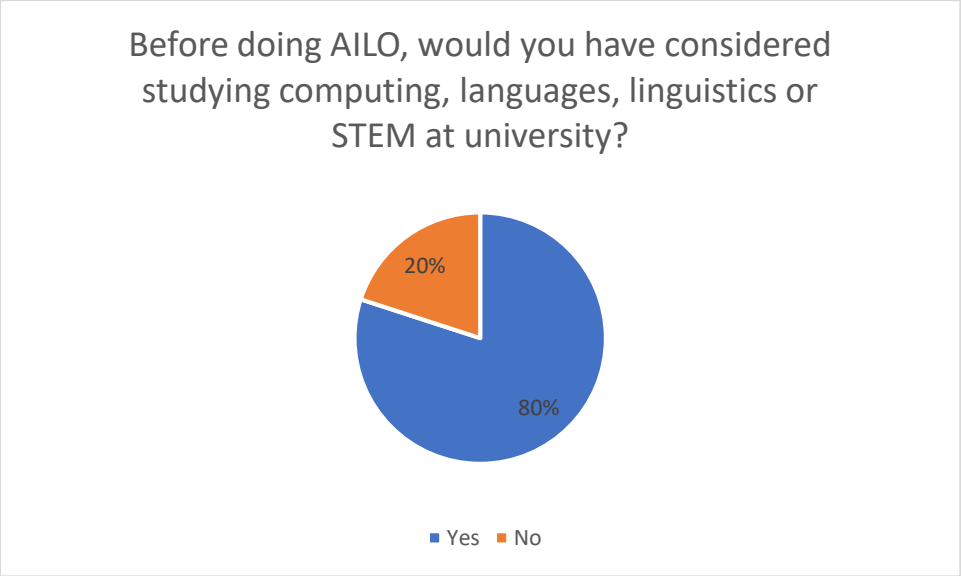
Q3.


How would you rate the difficulty level today compared with round 1?
80%
70%
60%
50%
40%
30%
20%
10%
0%
Much Easier
Easier
Same
Harder
Much harder

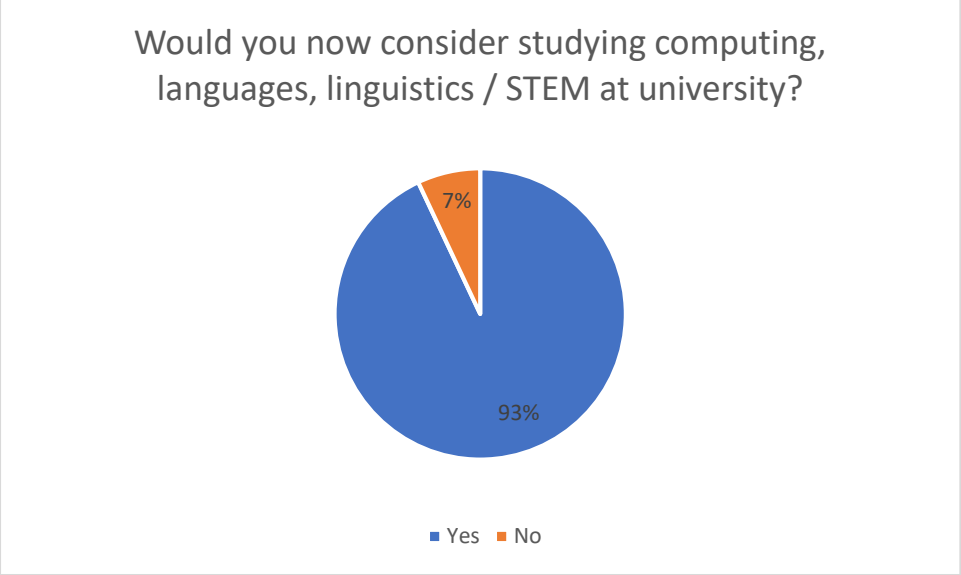
Q4.


Do you agree with the statement: I can see a link between problem solving and careers in Science, Technology, Engineering and Computing (STEM)?
Strongly Disagree
Disagree
Neutral
Agree
Strongly agree
0%
10%
20%
30%
40%
50%
60%

Q5.

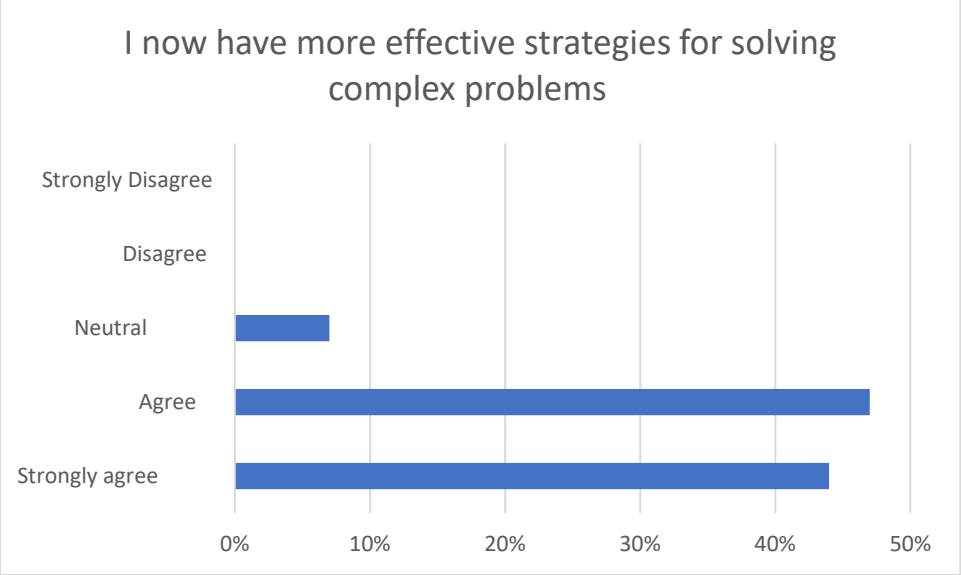

Before doing AILO, would you have considered studying computing, languages, linguistics or STEM at university?
20%
80%
Yes
No

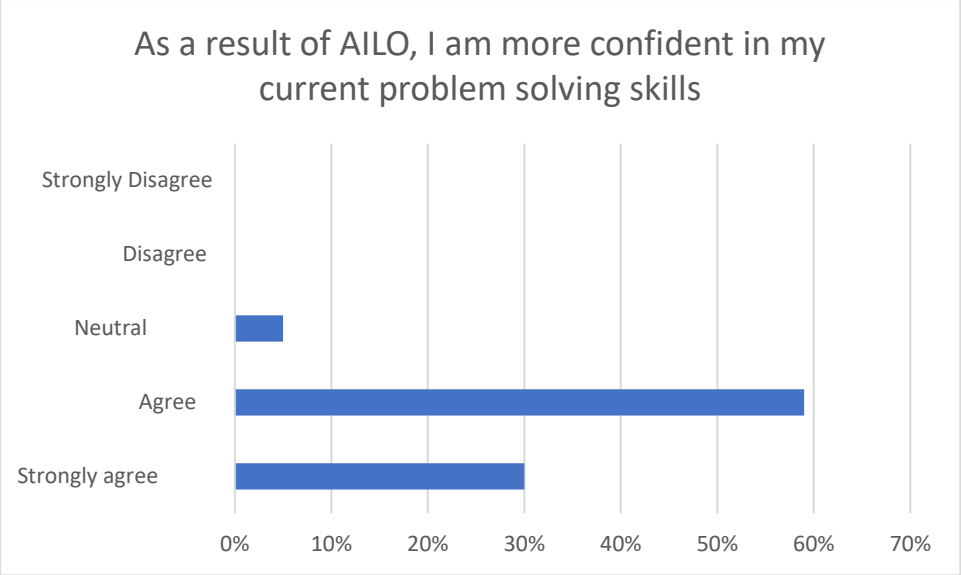
Q6.

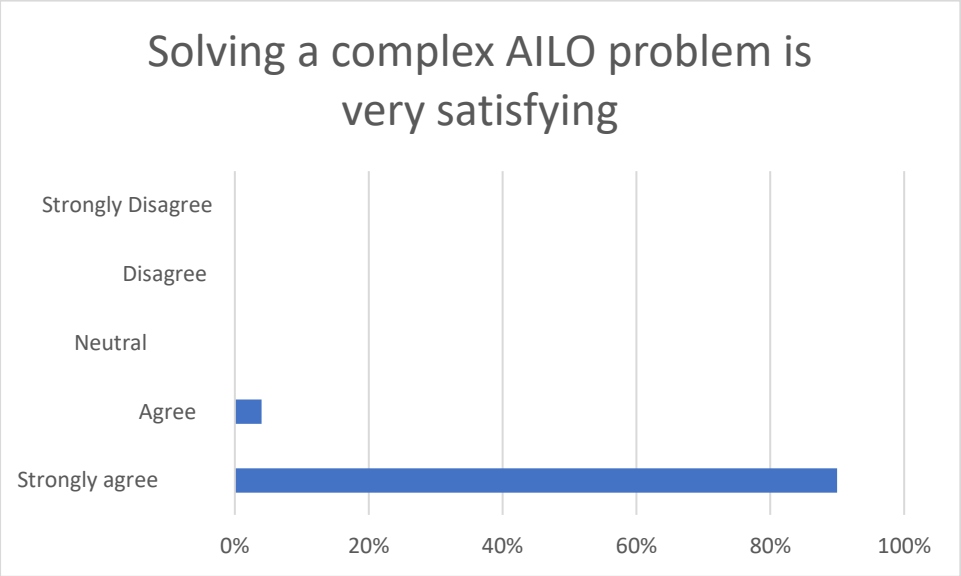

Would you now consider studying computing, languages, linguistics / STEM at university?
7%
93%
Yes
No

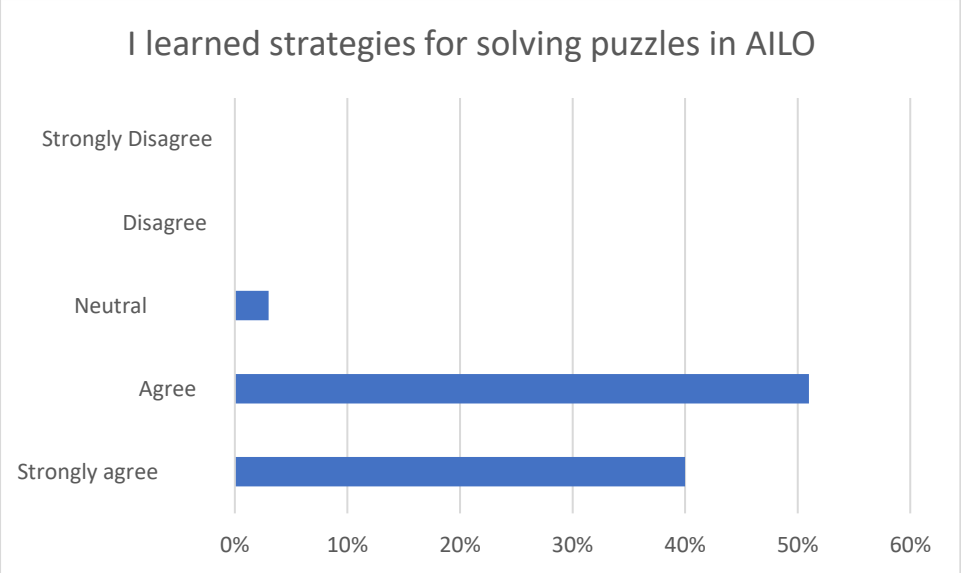
Q7.

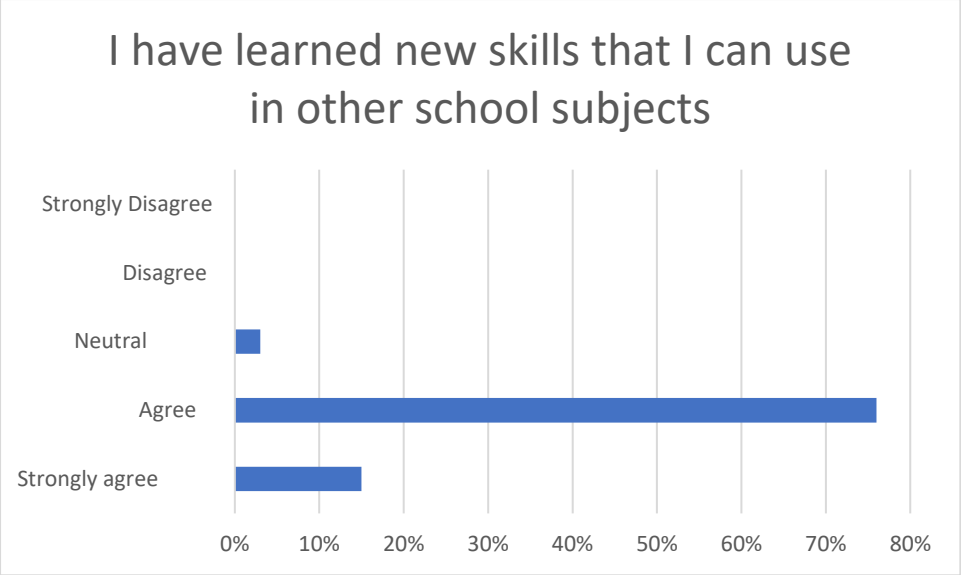
Q.8 How much do you agree / disagree with the following statements?




As a result of AILO, I am more confident in my current problem solving skills
Strongly Disagree
Disagree
Neutral
Agree
Strongly agree
0%
10%
20%
30%
40%
50%
60%
70%


Solving a complex AILO problem is very satisfying
Strongly Disagree
Disagree
Neutral
Agree
Strongly agree
0%
20%
40%
60%
80%
100%


I learned strategies for solving puzzles in AILO
Strongly Disagree
Disagree
Neutral
Agree
Strongly agree
0%
10%
20%
30%
40%
50%
60%


I have learned new skills that I can use in other school subjects
Strongly Disagree
Disagree
Neutral
Agree
Strongly agree
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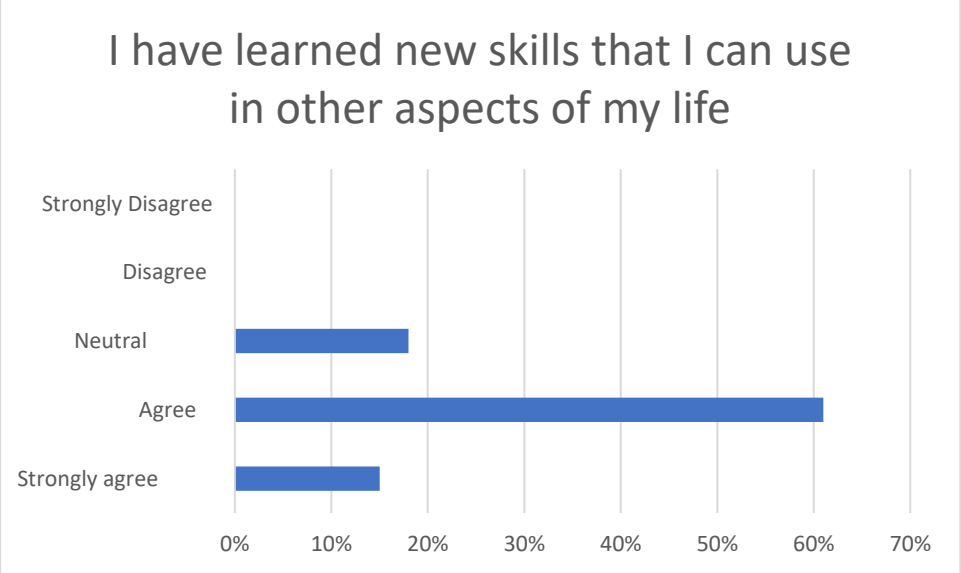
I have learned new skills that I can use in other aspects of my life
Strongly Disagree
Disagree
Neutral
Agree
Strongly agree
0%
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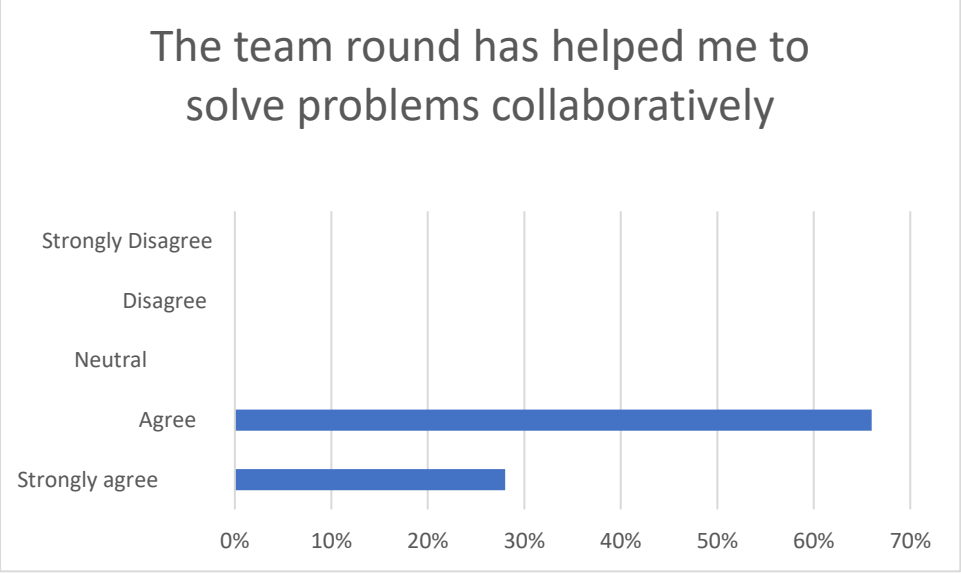
50%
60%
70%


The team round has helped me to solve problems collaboratively
Strongly Disagree
Disagree
Neutral
Agree
Strongly agree
0%
10%
20%
30%
40%
50%
60%
70%

## 10. Learnings from AILO 2018 National Final Survey Results and Marks for Writing Rules

- Improved confidence in problem-solving skills as they continued through the programme.

89% of respondents in the post-National Final survey strongly agreed / agreed that as a result of AILO they are more confident in their current problem-solving skills. The post-workshop figure was 79%.

- Improved effectiveness in tackling complex problems.

91% of respondents strongly agreed / agreed with the statement "I now have more effective strategies for solving complex problems". The post-workshop figure was 82%.

- Participants reported an improved propensity to study computing, languages or linguistics at third level as they continued through the programme.

The National Final 2018 survey results showed a consistent improvement in those considering studying computing, languages or linguistics at university with 80% stating they considered it pre-AILO final and 93% afterwards.

- Those that attended workshops were more likely to reach the AILO National Final

39% of Preliminary round (1350 students total) and 59% of National Final attendees (100 students total) had attended a workshop. This Final number would have been 61% but two students could not make the AILO final.

- Workshop attended were more likely to tackle the new bonus marks assessment questions (using tables / graphs to help write clear and concise rules).

51% of finalists attempted to write all rules based on their tables / charts while 86% of those who had been at a workshop attempted all rules questions. Students ability to analyse the data and write clear and concise rules was given marks with the top 10 students all having attempted all extra marks and 76% of the students in the top 20.

- Improved skills for other aspects of life

91% of respondents said they learned skills they can use in other school subjects and 76% said they learned skills they can use in other aspects of their lives.

## 11. Findings for AILO 2018/9

The findings from this evaluation has led to changes for the 2018/9 AILO Programme. In order to empower teachers, a new Teaching Materials 2018/9 Pack has been designed and will be made available on the AILO site.

The appetite for workshops and practise materials in the 2018 programme led to the creation of new monthly sample puzzles and a new 2018/9 problem-solving workshop programme with thanks funding from the Department of Culture, Arts and Heritage (DAHG). In order to track how many teachers / students are using the materials, the AILO website now tracks downloads and there is a short survey on use.

The learnings from the 2018 programme could be stronger with the views of the ADAPT tutors who deliver the workshops. The 2019 programme will survey the ADAPT researchers who deliver workshops to gain their opinions and learnings from the programme.

With the move to further assess student ability to analyse and present data clearly, the 2019 Preliminary Round will be extended to also award marks for analysing and writing rules. This will allow a wider view of the skill-set with 1400 secondary school students taking the preliminary round. A pre- and post-survey of these students will also be carried out.

In the 2019 National Final, a focus group for teachers and parents will be carried out.

Finally, in order to the understand the longer-term impacts of the AILO programme a longitudinal study of AILO Students will begin in 2019.

## 12. References

OECD (2014), PISA 2012 Results: Creative Problem Solving: Students' Skills in Tackling Real-Life Problems (Volume V), PISA, OECD Publishing. http://dx.doi.org/10.1787/9789264208070-en

OECD (2017), PISA 2015 Results: Collaborative Problem Solving (Volume V), PISA, OECD Publishing. http://www.oecd.org/publications/pisa-2015-results-volume-v-9789264285521-en.htm

WEF (2016) The Future of Jobs Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution. World Economic Forum http://reports.weforum.org/future-of-jobs-2016/chapter-1-the-future-of-jobs-and-skills/#view/fn-1

**Appendix A – Nov 2017–Jan 2018 Pre Workshop Survey**

**ADAPT AILO Workshop Nov 2017 – Jan 2018 – PRE AILO Workshop Survey**

Q1. Is this your first time to participate in an All Ireland Linguistics Olympiad event?

Yes / No

Q2. How did you hear about the AILO competition?

_____

Q3a. Did you complete practice puzzles before taking part in this workshop? Yes / No

Q3b. If 'Yes', how useful did you find these puzzles?

Very useful Useful Average Not very useful Not useful at all

Q4. How much do you agree / disagree with the following statements? (please circle)

I have effective strategies for solving complex problems

Strongly agree Agree Neutral Disagree Strongly Disagree

I am confident in my current problem solving skills

Strongly agree Agree Neutral Disagree Strongly Disagree

Q5. Had you considered studying computing, languages or linguistics at university prior to this workshop?

Yes / No

**Appendix B – Nov 2017–Jan 2018 Post Workshop Survey**

**ADAPT AILO Workshop Nov 2017 – Jan 2018 – POST AILO Workshop Survey**

Q1. Would you consider studying computing, languages or linguistics at university?

Yes / No

Q2. Would you recommend AILO to a friend?

Yes / No

Q3. Would you like to take Round 1 of AILO in your school at the end of January?

Yes / No

Q4. What is your overall assessment of the workshop today?

Very Satisfied Satisfied Neutral Unsatisfied Very Unsatisfied

Q5. What topics or aspects of this workshop did you find most interesting / useful?

_____

Q6. How much do you agree / disagree with the following statements? (please circle)

I have effective strategies for solving complex problems

Strongly agree Agree Neutral Disagree Strongly Disagree

I am confident in my current problem solving skills

Strongly agree Agree Neutral Disagree Strongly Disagree

I learned strategies for solving puzzles in this workshop

Strongly agree Agree Neutral Disagree Strongly Disagree

I would recommend this workshop to a friend

Strongly agree Agree Neutral Disagree Strongly Disagree

Comments / Feedback:

_____

_____

**Appendix C – March 2018 Post National Final Survey**

**ADAPT All Ireland Linguistics Olympiad 2018 Final Participant Questionnaire**

Please take a minute to complete the following questionnaire about your experience of AILO. It will help us immensely!

Q1. Did you try sample puzzles prior to taking Round 1 in your school?

Yes / No If yes, how useful were they?

Very useful Useful Average Not useful Not at all useful

Q2. Did you attend a workshop?

Yes / No

If yes, how useful was it?

Very useful Useful Average Not useful Not at all useful

Q3. How would you rate the difficulty level today compared with round 1?

Much Easier Easier Same Harder Much harder

Q4. Do you agree with the statement: *I can see a link between problem solving and careers in Science, Technology, Engineering and Computing (STEM)*?

Strongly agree Agree Neutral Disagree Strongly Disagree

Q5. Before doing AILO, would you have considered studying computing, languages, linguistics or STEM at university?

Yes / No

Q6. Would you now consider studying computing, languages, linguistics / STEM at university?

Yes / No

Q7. Would you recommend AILO as a competition for sharpening problem solving skills?

Yes / No

Q8. How much do you agree / disagree with the following statements? (please circle)

I now have more effective strategies for solving complex problems

Strongly agree Agree Neutral Disagree Strongly Disagree

As a result of AILO, I am more confident in my current problem solving skills

Strongly agree Agree Neutral Disagree Strongly Disagree

Solving a complex AILO problem is very satisfying

Strongly agree Agree Neutral Disagree Strongly Disagree

I learned strategies for solving puzzles in AILO

Strongly agree Agree Neutral Disagree Strongly Disagree

I have learned new skills that I can use in other school subjects

Strongly agree Agree Neutral Disagree Strongly Disagree

I have learned new skills that I can use in other aspects of my life

Strongly agree Agree Neutral Disagree Strongly Disagree

The team round has helped me to solve problems collaboratively

Strongly agree Agree Neutral Disagree Strongly Disagree

Comments / Other Feedback:

**Thank you!**

**Appendix D: The AILO Expected Learning Outcomes by phase of the Programme and the correlation with the PISA Competencies**

| **Expected Learning Outcomes – Participation Round of AILO** | | | | |
|---|---|---|---|---|
| **Students learn about** | **Students should be able to:** | **JC Coding** | **JC Maths** | **PISA Competencies (and collaborative (2015)** |
| Importance of problem solving skills and links to ADAPT work<br><br>Introductory Logic puzzles<br><br>Introduction to the 6 types of AILO puzzle | 1.1 Discuss the importance of problem solving skills with their peers<br>1.2 Complete introductory logic puzzles 1-10<br>1.3 Recognise the 6 types of AILO puzzle – number systems, semantics, writing systems, phonetics, syntax, morphology. | ✓ | ✓ | Exploring and understanding the information provided with the problem. |

| **Expected Learning Outcomes – Problem-Solving Workshops** | | | | |
|---|---|---|---|---|
| **Students learn about** | **Students should be able to:** | **JC Coding** | **JC Maths** | **PISA Competencies 2012 (and collaborative (2015)** |
| ADAPT tutor's career path & ADAPT research background<br><br>Seeing patterns and trends in complex logic puzzles<br><br>Problem solving strategies for each of the 6 types of AILO puzzle.<br><br>Collaborative problem-solving techniques<br><br>Expressing ideas clearly and accurately | 1.1 Discuss the importance of problem-solving skills as a key component in a STEM career.<br>1.2 Complete logic puzzles 10-20<br>1.3 Recognise features that will make a language rule.<br>1.4 Understand when and how to use tables and charts to decipher data for each problem type (number systems, semantics, writing systems, phonetics, syntax, morphology.)<br>1.5 Describe the observations they made about the language with concise and complete rules. | ✓<br><br>✓ | <br><br>✓<br><br>✓ | Exploring and understanding the information provided with the problem.<br><br>Representing and formulating: constructing graphical, tabular, symbolic or verbal representations of the problem situation and formulating hypotheses about the relevant factors and relationships between them.<br><br>Planning and executing: devising a plan by setting goals and sub-goals, and executing the sequential steps identified in the plan.<br><br>Employing logic and reasoning and (where relevant) working collaboratively to arrive at the optimal solution to a problem. |

| | | | | |
|---|---|---|---|---|
| Gathering, interpreting and representing data | 1.6 Work as a team and reflect on their role in the team. | ✓ | | Monitoring and reflecting: monitoring progress, reacting to feedback, and reflecting on the solution, the information provided with the problem, or the strategy adopted. |

**Expected Learning Outcomes – AILO Preliminary Round**

| **Students learn about** | **Students should be able to:** | **JC Coding** | **JC Maths** | **PISA Competencies 2012 (and collaborative (2015)** |
|---|---|---|---|---|
| Utilising strategies effectively<br><br>Exploring actions and alternatives | 1.1 Decide which tool (such as tables and charts) to utilise to analyse data effectively in a time-limited exam.<br>1.2 As the solution is not immediately obvious, students should be able to explore ideas and alternatives, evaluate ideas and actions and take more responsibility for their learning. | ✓ | ✓<br><br>✓ | Exploring and understanding (as above).<br><br>Representing and formulating (as above).<br><br>Planning and executing (as above).<br><br>Employing logic and reasoning to arrive at the optimal solution to a problem individually.<br><br>Monitoring and reflecting (as above). |

**Expected Learning Outcomes – AILO National Final**

| **Students learn about** | **Students should be able to:** | **JC Coding** | **JC Maths** | **PISA Competencies 2012 (and collaborative (2015)** |
|---|---|---|---|---|
| Utilising strategies effectively<br><br>Exploring actions and alternatives<br><br>Expressing ideas clearly and accurately | 1.1 Students can decide which tool (such as tables and charts) to utilise to analyse data effectively in a time-limited exam.<br>1.2 As the solution is not immediately obvious, students should be able to explore ideas and alternatives, evaluate ideas and actions and take more responsibility for their learning. | ✓ | ✓<br><br>✓<br><br>✓ | Exploring and understanding (as above).<br><br>Representing and formulating (as above).<br><br>Planning and executing (as above).<br><br>Employing logic and reasoning and (where relevant) working collaboratively to arrive at the optimal solution to a problem.<br><br>Monitoring and reflecting (as above). |

| | | | | |
|---|---|---|---|---|
| | 1.3 Students can explain their thinking and justify their reasoning, writing concise and complete rules to explain their answers<br>1.4 Follow the rules they have written to answer the questions and check for completeness. | <br><br><br>✓ | ✓<br><br><br>✓ | |

| **Expected Learning Outcomes – IOL Level** | | | | |
|---|---|---|---|---|
| **Students learn about** | **Students should be able to:** | **JC Coding** | **JC Maths** | **PISA Competencies 2012 (and collaborative (2015)** |
| IOL problem types and recognising features<br><br>Working as a team<br><br>Utilising strategies effectively<br><br>Exploring actions and alternatives<br><br>Expressing ideas clearly and accurately | 1.1 Recognise each IOL-level puzzle and which features to look for in each puzzle.<br>1.2 Decide which strategy to utilise to analyse data effectively in a time-limited exam.<br>1.3 Explore ideas and alternatives, evaluate ideas and actions and take more responsibility for their learning.<br>1.4 Write concise and complete rules to explain their answers.<br>1.5 Follow the rules they have written to answer the questions and check for completeness.<br>1.6 Work effectively on a four-person team puzzle.<br>1.7 Reflect on their solution strategies and compare them to those of others as part of the team. | <br><br>✓<br>✓ | <br>✓<br>✓<br>✓<br><br>✓ | Exploring and understanding (as above).<br><br>Representing and formulating (as above).<br><br>Planning and executing (as above).<br><br>Employing logic and reasoning and (where relevant) working collaboratively to arrive at the optimal solution to a problem.<br><br>Monitoring and reflecting (as above). |

**Appendix E: ADAPT AILO Problem Solving Olympiad and Key Junior Certificate Skills**

In addition to their specific content and knowledge, the subjects and short courses of junior cycle provide students with opportunities to develop a range of key skills in order to achieve set Statements of Learning. This document describes the links between AILO and the Junior Cycle Key Skills (Table 1) and Statements of Learning (Table 2). Figure 1 shows the Junior Cycle (JC) curriculum focuses on eight key skills (and their constituent elements):

Figure 1: Key skills of Junior Cycle

Table 1: Links between ADAPT AILO Problem Solving Olympiad and Junior Certificate (JC) key skills

| **JC Key Skill** | **Key Skill Element** | **JC Coding?** | **JC Maths?** | **ADAPT AILO Problem Solving Student Learning Activity** |
|---|---|---|---|---|
| Being creative | Exploring options and alternatives | | ✓ | As students engage in a task for which the solution is not immediately obvious, they ask questions, explore ideas and alternatives, evaluate ideas and actions and take more responsibility for their learning. |
| | Learning creatively | | | Students problem solve in a new way outside of the regular curriculum. |
| Being literate | Expressing ideas clearly and accurately | ✓ | ✓ | Students use tools such as tables and charts to analyse data, and structures rules to present results. Students explain their thinking and justify their reasoning, using tables, charts and rules appropriately and accurately. |
| | Developing my understanding and enjoyment of words and language. | | | Students become aware of new languages structures, patterns and influence on their own language learning. |
| Being numerate | Seeing patterns, trends and relationships | ✓ | ✓ | Students develop strategies to analyse language data and note patterns and relationships. |
| | Gathering, interpreting and representing data | | ✓ | Students generate rules that describe the grammar of the language data. |
| | Developing a positive disposition towards investigating, reasoning and problem-solving | | ✓ | Students solve complex problems which demonstrate their use and understanding of mathematical and computational ideas. |
| Communicating | Using language | ✓ | ✓ | Students become familiar with other language structures. |

| | | | | |
|---|---|---|---|---|
| | Using numbers<br><br>Discussing and debating | | | Students use logic and numerical skill to solve problems; to support their reasoning and conclusions; and to convey and explain patterns and relationships.<br><br>Students discuss ideas, evaluate the pros and cons of different approaches, and propose solutions. |
| Managing information and thinking | Thinking creatively and critically. | ✓ | ✓ | Students engage in tasks which require them to use their mathematical knowledge and skills in novel ways. |
| Managing myself | Setting and achieving personal goals<br><br>Being able to reflect on my own learning | ✓ | <br><br>✓ | Students take responsibility for personal learning by setting goals and seeking help when necessary from classmates, the teacher or the AILO online training page, and by reflecting on the feedback they receive.<br><br>Students reflect on which learning activities they find most effective, using this knowledge to help further their learning in mathematics. |
| Staying well | Being social<br><br>Being confident | | <br>✓ | Students get to know students in their local schools and around the country with similar interests.<br><br>Students enjoy frequent opportunities to experience success in solving complex problems. They experience a positive approach to learning in which different approaches are valued and they are encouraged to learn from mistakes. |
| Working with others | Co-operating<br><br>Learning with others | ✓ | <br>✓ | Students develop good working relationships with others working in AILO teams.<br><br>They learn how to engage in collaborative work. |

**Appendix F: Links between ADAPT AILO Problem Solving Olympiad and Junior Certificate Statements of Learning (SOL)**

| Junior Cert Statement of Learning (SOL) | JC Coding? | JC Maths? | Examples of Related Learning in the ADAPT AILO Problem Solving Olympiad |
|---|---|---|---|
| SOL 1: The student communicates effectively using a variety of means in a range of contexts in their first language. | | ✓ | Students organise, consolidate and communicate logical thinking clearly and coherently to peers, teachers and others verbally, and in written form using tables and charts with relevant language symbols. |
| SOL 2: Listens, speaks, reads and writes in L2 and one other language at a level of proficiency that is appropriate to her or his ability | | | Students are introduced to a multitude of new languages. Students gain knowledge of new language structures and writing systems which can apply in their learning of a foreign language. |
| SOL 15: The student recognises the potential uses of mathematical knowledge, skills and understanding in all areas of learning | | ✓ | Students apply their problem-solving knowledge and skills to a wide variety of problems across different subjects, including gathering, analysing, and presenting data, and using logic to model real-world situations. |
| SOL 16: The student describes, illustrates, interprets, predicts and explains patterns and relationships | ✓ | ✓ | Students use tools such as tables and charts to analyse data. Students interpret patterns in the data and describe their thinking and justify their reasoning. They then write succinct rules to present these relationships.<br><br>Students become aware of new languages structures, patterns and influence on their own language learning. |
| SOL 17: The student devises and evaluates strategies for investigating and solving problems using mathematical knowledge, reasoning and skills | ✓ | ✓ | Students develop strategies to analyse language data and note patterns and relationships. Students develop problem-solving strategies through engaging in these tasks for which the solution is not immediately obvious. They reflect on their own solution strategies to such tasks<br>and compare them to those of others as part of team element of AILO. |

| | | | |
|---|---|---|---|
| SOL 18: The student observes and evaluates empirical events and processes and draws valid deductions and conclusions. | | ✓ | Students generate and summarise data, select appropriate graphical or numerical methods to describe it, and draw conclusions from graphical and numerical summaries of the data. As part of their understanding language data, they come to appreciate the distinction between contingent deductions from particular cases, and deductions which can be proved to be universally true. |
| SOL 19: The student values the role and contribution of science and technology to society, and their personal, social and global importance. | | | Students develop an understanding of collaborative and creative problem-solving as a key skillset underpinning core disciplines of ADAPT research including computer science, artificial intelligence and language technology. |