

1 00:00:00,080 --> 00:00:01,400 Hi there.
2 00:00:01,400 --> 00:00:02,900 My name is Richard Fitzpatrick.
3 00:00:02,900 --> 00:00:05,000 I am a Postdoc in bioinformatics education
4 00:00:05,000 --> 00:00:06,240 at the University of Edinburgh.
5 00:00:06,240 --> 00:00:08,820 And I'm delighted to present my poster introducing
6 00:00:08,820 --> 00:00:09,920 Scottish school students to
7 00:00:09,920 --> 00:00:12,440 bioinformatics through the 4273 Pi project.
8 00:00:12,440 --> 00:00:14,340 I don't have time in this video to cover everything,
9 00:00:14,340 --> 00:00:15,740 so if you want to find out more,
10 00:00:15,740 --> 00:00:18,380 please do catch me during the conference virtually or
11 00:00:18,380 --> 00:00:21,600 contact me on the details that you can see below.
12 00:00:21,600 --> 00:00:23,020 Thank you.
13 00:00:23,020 --> 00:00:25,100 The project is not just me.
14 00:00:25,100 --> 00:00:26,720 I'm the workshop leader currently for
15 00:00:26,720 --> 00:00:28,600 the 4273 Pi project,
16 00:00:28,600 --> 00:00:30,800 but the team is much broader than that.
17 00:00:30,800 --> 00:00:32,380 Daniel Barker was the one that helped
18 00:00:32,380 --> 00:00:33,860 originate this way back in about
19 00:00:33,860 --> 00:00:38,000 2016 as a public engagement project in Scotland.
20 00:00:38,000 --> 00:00:39,720 And you can see we still have members in St.
21 00:00:39,720 --> 00:00:41,195 Andrews where they started.
22 00:00:41,195 --> 00:00:42,710 We are mainly in Edinburgh,
23 00:00:42,710 --> 00:00:44,130 but we also have people in Glasgow.
24 00:00:44,130 --> 00:00:45,630 If people are wanting to take part,
25 00:00:45,630 --> 00:00:46,430 and want to find out
26 00:00:46,430 --> 00:00:48,390 more about taking part in this project.
27 00:00:48,390 --> 00:00:49,430 Please do get in touch with me.
28 00:00:49,430 --> 00:00:53,390 We'd be delighted to have you. Our aims are broadly to
29 00:00:53,390 --> 00:00:55,790 reach all Scottish secondary schools
30 00:00:55,790 --> 00:00:57,510 and deliver workshops,
31 00:00:57,510 --> 00:01:00,230 or teacher training to help these schools
32 00:01:00,230 --> 00:01:02,430 understand bioinformatics a little
33 00:01:02,430 --> 00:01:04,110 bit more than they currently perhaps do.
34 00:01:04,110 --> 00:01:05,830 There's currently bioinformatics on
35 00:01:05,830 --> 00:01:07,410 the Scottish school curriculum for
36 00:01:07,410 --> 00:01:09,370 Higher Biology and Human Biology,
37 00:01:09,370 --> 00:01:11,990 which is aimed at about 16 to 18 year olds.
38 00:01:11,990 --> 00:01:13,310 But we find that teachers
39 00:01:13,310 --> 00:01:15,310 often either don't have the background in
40 00:01:15,310 --> 00:01:17,770 bioinformatics or the confidence in explaining
41 00:01:17,770 --> 00:01:20,230 bioinformatics to school students
42 00:01:20,230 --> 00:01:21,710 in a way which makes sense.
43 00:01:21,710 --> 00:01:24,870 What we do is we either deliver in person student
44 00:01:24,870 --> 00:01:28,210 workshops around bioinformatics at two different levels,
45 00:01:28,210 --> 00:01:29,730 which I'll talk about in a minute.
46 00:01:29,730 --> 00:01:32,430 Or we deliver teacher training to help teachers to
47 00:01:32,430 --> 00:01:33,650 deliver the materials that we've
48 00:01:33,650 --> 00:01:35,210 already made for those workshops,
49 00:01:35,210 --> 00:01:36,990 and to help them embed
50 00:01:36,990 --> 00:01:39,130 parts of that into their own teaching practice.
51 00:01:39,130 --> 00:01:40,770 We provide them with the lesson plans,
52 00:01:40,770 --> 00:01:43,250 our teaching materials, our worksheets,
53 00:01:43,250 --> 00:01:45,050 and they can use that to fit
54 00:01:45,050 --> 00:01:47,430 into their own teaching wherever they may be.
55 00:01:47,430 --> 00:01:49,270 In Scotland, we've reached

56 00:01:49,270 --> 00:01:52,910 50% of Scottish secondary schools with this approach
57 00:01:52,910 --> 00:01:56,310 so far. We hope to reach 75 % over the coming few years.
58 00:01:56,310 --> 00:01:58,370 We're really looking forward to
59 00:01:58,370 --> 00:02:01,470 seeing how far we can take this project.
60 00:02:01,950 --> 00:02:04,770 Talking about reach, you can see that we've
61 00:02:04,770 --> 00:02:06,670 reached all the way up to the Shetland Isles,
62 00:02:06,670 --> 00:02:08,510 all the way down to the borders of England.
63 00:02:08,510 --> 00:02:10,530 And this reach is quite wide reaching
64 00:02:10,530 --> 00:02:13,070 as it is the central belt there,
65 00:02:13,070 --> 00:02:15,010 which you can see in the box shows you,
66 00:02:15,010 --> 00:02:16,350 this is the most densely
67 00:02:16,350 --> 00:02:18,150 populated area of Scotland.
68 00:02:18,150 --> 00:02:19,970 You can see that we've got a good reach there,
69 00:02:19,970 --> 00:02:22,090 but we still have a lot to do.
70 00:02:22,090 --> 00:02:24,830 The reason why we perhaps haven't always visited
71 00:02:24,830 --> 00:02:26,770 places in those areas is there's
72 00:02:26,770 --> 00:02:27,910 something called the Scottish
73 00:02:27,910 --> 00:02:29,410 Index of Multiple Deprivation
74 00:02:29,410 --> 00:02:32,530 which factors into our delivering of workshops.
75 00:02:32,530 --> 00:02:35,950 We put calls out online on a mailing list called SYNAPSE,
76 00:02:35,950 --> 00:02:37,410 and it's usually quite popular.
77 00:02:37,410 --> 00:02:41,030 People are really interested in taking our workshops on.
78 00:02:41,030 --> 00:02:43,010 For especially these workshops,
79 00:02:43,010 --> 00:02:44,970 we have a lot of repeat interest as well.
80 00:02:44,970 --> 00:02:47,670 We're trying to focus on schools which are
81 00:02:47,670 --> 00:02:51,090 low on this Scottish index of multiple deprivation (SIMD),
82 00:02:51,090 --> 00:02:52,710 which is quite complicated.
83 00:02:52,710 --> 00:02:55,470 But it helps us measure areas where the level of
84 00:02:55,470 --> 00:02:57,050 opportunities for various things are
85 00:02:57,050 --> 00:02:59,050 perhaps lower than elsewhere.
86 00:02:59,050 --> 00:03:01,970 It tends to be targeting areas and
87 00:03:01,970 --> 00:03:05,170 reaching pupils which are perhaps...
88 00:03:05,170 --> 00:03:06,470 don't always get the level
89 00:03:06,470 --> 00:03:08,950 of university interaction, for example,
90 00:03:08,950 --> 00:03:10,950 as others in the higher levels
91 00:03:10,950 --> 00:03:15,110 would. We have three workshops,
92 00:03:15,110 --> 00:03:17,390 two which we currently do quite a lot of,
93 00:03:17,390 --> 00:03:18,510 and one which we're just
94 00:03:18,510 --> 00:03:20,250 finishing developing and we're hoping to
95 00:03:20,250 --> 00:03:23,810 take into schools in the coming autumn.
96 00:03:23,810 --> 00:03:26,310 Food Detective is aimed at younger students.
97 00:03:26,310 --> 00:03:27,970 This is aimed at national five level,
98 00:03:27,970 --> 00:03:29,870 which is about 15 years old.
99 00:03:29,870 --> 00:03:31,870 At this level, they know what
100 00:03:31,870 --> 00:03:34,930 DNA is and they know something about the central dogma,
101 00:03:34,930 --> 00:03:37,470 but not massive amounts about DNA,
102 00:03:37,470 --> 00:03:40,370 and especially nothing really about bioinformatics.
103 00:03:40,370 --> 00:03:42,430 We generally introduce this,
104 00:03:42,430 --> 00:03:45,690 we have this narrative we have
105 00:03:45,690 --> 00:03:48,590 where we have a handmade pork sausage which we sequenced.
106 00:03:48,590 --> 00:03:49,750 It was real many, many years
107 00:03:49,750 --> 00:03:52,250 ago and there's a series of DNA barcodes that
108 00:03:52,250 --> 00:03:54,130 we ask them to run BLAST searches
109 00:03:54,130 --> 00:03:55,990 on and see where they've come from,
110 00:03:55,990 --> 00:03:58,210 and then come up with hypotheses about how

111 00:03:58,210 --> 00:03:59,990 these particular barcodes for
112 00:03:59,990 --> 00:04:01,370 these particular animals came
113 00:04:01,370 --> 00:04:02,830 to be found in this pork sausage.
114 00:04:02,830 --> 00:04:04,210 And we have a lot of fun with that.
115 00:04:04,210 --> 00:04:05,990 It uses freely available
116 00:04:05,990 --> 00:04:08,070 resources and we can do it on any device.
117 00:04:08,070 --> 00:04:10,730 This makes it quite portable and quite easy for
118 00:04:10,730 --> 00:04:12,070 teachers to also embed this in
119 00:04:12,070 --> 00:04:14,290 their own practice if they wish.
120 00:04:14,290 --> 00:04:16,650 The second workshop is
121 00:04:16,650 --> 00:04:18,630 more tightly linked to the curriculum,
122 00:04:18,630 > 00:04:21,090 and so is perhaps the one most in demand.
123 00:04:21,090 --> 00:04:23,510 This is aimed at the higher level,
124 00:04:23,510 --> 00:04:25,290 this is 16 18 year olds.
125 00:04:25,290 --> 00:04:26,790 As I've said, it focuses
126 00:04:26,790 --> 00:04:28,330 on something called the Gulo gene,
127 00:04:28,330 --> 00:04:30,690 which is involved in vitamin C synthesis.
128 00:04:30,690 --> 00:04:32,710 We provide a case study where we ask
129 00:04:32,710 --> 00:04:35,065 them to go and find out this Unknown protein.
130 00:04:35,065 --> 00:04:36,920 Do a BLAST search, find out what it is,
131 00:04:36,920 --> 00:04:38,660 find out what organism it comes from,
132 00:04:38,660 --> 00:04:40,820 and then see whether humans have something similar.
133 00:04:40,820 --> 00:04:43,760 We do a DNA sequence alignment using the BLAST website,
134 00:04:43,760 --> 00:04:45,380 and they find that there is
135 00:04:45,380 > 00:04:48,340 a pseudogene as a result of a series of substitution,
136 00:04:48,340 --> 00:04:50,180 insertion and deletion mutations.
137 00:04:50,180 --> 00:04:51,900 We can talk to them about that knowledge,
138 00:04:51,900 --> 00:04:54,120 which they already have as part of their degree.
139 00:04:54,120 --> 00:04:55,580 We talk about frameshifts.
140 00:04:55,580 --> 00:04:58,760 The human gene has a series of frameshift mutations.
141 00:04:58,760 --> 00:05:02,440 We can talk to them about what the implications of those
142 00:05:02,440 --> 00:05:06,340 have been for the actual protein that possibly is made.
143 00:05:06,340 --> 00:05:08,660 And then the evolutionary
144 00:05:08,660 --> 00:05:10,500 chatter that we can have about that.
145 00:05:10,500 --> 00:05:11,880 Why is it that humans didn't
146 00:05:11,880 --> 00:05:13,725 die out if we still need vitamin C?
147 00:05:13,725 --> 00:05:16,450 We talk about things like diet and other organisms as well
148 00:05:16,450 > 00:05:18,730 if we have time. And then what we do is
149 00:05:18,730 --> 00:05:21,270 we replicate that using the Raspberry Pi computer.
150 00:05:21,270 --> 00:05:23,070 These are little mini portable computers
151 00:05:23,070 --> 00:05:24,290 we take into the schools.
152 00:05:24,290 --> 00:05:25,690 It exposes the students to
153 00:05:25,690 --> 00:05:28,270 a Linux environment and a command line environment.
154 00:05:28,270 --> 00:05:29,670 We can talk to them about how
155 00:05:29,670 > 00:05:31,350 bioinformaticians tend to use that.
156 00:05:31,350 --> 00:05:33,550 Because of how we are using data and
157 00:05:33,550 --> 00:05:36,410 processing data and the size of our datasets.
158 00:05:36,410 --> 00:05:38,650 We tend to have volunteers come along who are
159 00:05:38,650 --> 00:05:40,730 bioinformaticians at various different levels.
160 00:05:40,730 --> 00:05:42,450 All the way from master students and
161 00:05:42,450 --> 00:05:43,890 Phd students all the way up to
162 00:05:43,890 --> 00:05:45,930 heads of bioinformatics departments.
163 00:05:45,930 --> 00:05:48,950 The students get the chance to talk to
164 00:05:48,950 --> 00:05:52,450 a lot of people with very different backgrounds as well
165 00:05:52,450 --> 00:05:53,890 coming into bioinformatics ,

166 00:05:53,890 --> 00:05:56,450 which people find quite interesting.
167 00:05:56,450 --> 00:05:58,410 We have a brand new workshop
168 00:05:58,410 > 00:05:59,850 that we're hoping to deliver as well,
169 00:05:59,850 --> 00:06:01,250 which is based on PCR,
170 00:06:01,250 --> 00:06:03,430 which is something which is also on the curriculum.
171 00:06:03,430 --> 00:06:05,130 We're focusing on primer design,
172 00:06:05,130 --> 00:06:07,310 which is the most bioinformatics element to it,
173 00:06:07,310 --> 00:06:08,870 but I'm trying to introduce a lot
174 00:06:08,870 --> 00:06:10,230 of student choice in this.
175 00:06:10,230 --> 00:06:13,110 There's going to be six different case studies which are
176 00:06:13,110 --> 00:06:16,010 Scottish specific case studies around various animals.
177 00:06:16,010 --> 00:06:17,390 And students are going to be able to
178 00:06:17,390 --> 00:06:19,050 pick how the workshop is going to go.
179 00:06:19,050 --> 00:06:19,870 They'll be able to choose
180 00:06:19,870 --> 00:06:21,290 the case study they want to look at,
181 00:06:21,290 > 00:06:21,950 which will all have
182 00:06:21,950 --> 00:06:23,810 different slight problem solving activities.
183 00:06:23,810 --> 00:06:25,310 And then we'll come together as a group and
184 00:06:25,310 --> 00:06:27,010 focus on one in more detail.
185 00:06:27,010 --> 00:06:28,705 Each workshop is going to be different,
186 00:06:28,705 --> 00:06:30,440 a lot of student choice.
187 00:06:30,440 --> 00:06:32,920 And we're doing that because we're finding that we
188 00:06:32,920 --> 00:06:36,080 need to change and evolve with students as time goes on.
189 00:06:36,080 --> 00:06:37,820 This is something which is becoming
190 00:06:37,820 --> 00:06:39,560 quite important as different skills
191 00:06:39,560 --> 00:06:41,040 are being developed in students
192 00:06:41,040 --> 00:06:43,080 that we are not necessarily capitalising on.
193 00:06:43,080 --> 00:06:44,760 I'm very much interested in game
194 00:06:44,760 --> 00:06:46,980 based learning and using games in teaching
195 00:06:46,980 --> 00:06:48,580 We've got in development, some
196 00:06:48,580 --> 00:06:50,240 areas to help visualise some of
197 00:06:50,240 --> 00:06:51,820 that sequence alignment data I talked
198 00:06:51,820 --> 00:06:54,380 about in the second workshop using Minecraft.
199 00:06:54,380 --> 00:06:56,260 Not got any more time than that.
200 00:06:56,260 --> 00:06:57,600 Thank you very much for listening.
201 00:06:57,600 --> 00:06:59,020 If you want to catch me at the conference,
202 00:06:59,020 --> 00:07:02,100 please do, and thank you for coming along to the poster.