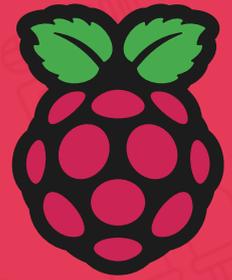


The impact of sustained engagement after Picademy



Raspberry Pi Foundation
Jonathan Dickins
October 2021

Raspberry Pi Foundation Research No. 17



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Executive summary

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The introduction of computing to curricula all over the world has led to an increase in demand for professional learning in computing and digital making. The Raspberry Pi Foundation offers a two-day intensive digital making workshop for primary and secondary (K–12) educators, focusing on hands-on, collaborative activities that can be directly implemented in formal and informal learning settings. After completing the two-day workshop, participants become Raspberry Pi Certified Educators and join a community of like-minded professionals. Since 2014, 2500 educators in the UK and North America have taken part in Picademy professional development events.

This report summarises the findings from three annual surveys of the Certified Educator community in 2017, 2018, and 2019. As research has consistently shown that professional development is more effective when it is sustained, we investigated the long-term impact of Picademy on the educators involved to assess its effectiveness. We found evidence that engagement is sustained after Picademy, and can last for several years after the initial workshop. Our key findings are:

1. Certified Educators continue to apply what they learnt several years after taking part in Picademy.

The vast majority of Certified Educators integrate what they learnt at Picademy into their teaching: 89% of Certified Educators who took part in Picademy within the last 12 months reported using what they learnt. Among those who took part between 13 and 24 months ago, this figure increased to 96%.

2. The two greatest challenges reported by Certified Educators are a lack of funding for equipment and lack of time to plan creative activities.

Certified Educators reported that the availability of and funding for equipment became less challenging with time. However, challenges related to the lack of time for planning creative activities and for developing their own skills and confidence remained constant, regardless of the time since the Certified Educators had attended Picademy.

3. How Certified Educators perceive their impact on learners increases over time.

Certified Educators generally feel very positive about the impact they have on their learners, particularly with regard to their learners' programming skills and interest in programming and computers. Certified Educators surveyed within the first 12 months following Picademy felt only slightly more positive about their impact

compared with those who had taken part in Picademy more than 12 months ago.

4. Certified Educators continue to share what they learnt at Picademy with their peers, with many sharing in new ways as time goes on.

Certified Educators share what they learnt at Picademy in different ways. Many shared their experience formally or informally with their colleagues within 12 months of taking part in Picademy, but educators who have been certified for more than 12 months are more likely to share even further at conferences or training sessions in their local area and beyond.

5. Certified Educators engage with other Raspberry Pi Foundation programmes and resources. More than half of those that responded regularly read Hello World, the Foundation's magazine for educators, with 67% of those who undertook Picademy two to three years ago doing so. Certified Educators also run Code Clubs and take part in our online courses for educators.

6. Certified Educators' confidence in applying different teaching approaches develops over time. Certified Educators report higher levels of confidence in teaching general computing concepts (e.g. programming), as well as specific concepts (e.g. using text-based programming languages) with time. This suggests that Certified Educators feel that they are able to successfully build upon the skills learnt at Picademy.

It can take some time for educators to implement what they have learnt, and to overcome some of the initial challenges encountered when working with a new technique or technology. A hands-on, developmental approach to physical computing helps educators to see what is possible and how they can apply it in their own practice.

There is significant time pressure on educators, so any training must represent both a valuable use of time in itself, and give educators approaches that they can use and develop without significant additional time or work required. This report suggests that educator training has a greater overall impact, and represents a better investment of time, when educators feel confident and enthusiastic about sharing what they have learnt among their colleagues and other educators. Giving educators the confidence and skills to implement what they have learnt means that they are more likely to share what they have learnt.

Introduction

Introduction

Since 2014, 2500 educators in the UK and North America have taken part in Picademy professional development events. After the two-day introduction to physical computing, participants are accredited as Raspberry Pi Certified Educators and become part of a vibrant community. As part of this community, educators have access to a dedicated forum, regular updates on the Foundation's work, and new opportunities to engage with the Raspberry Pi Foundation.

Table 1 shows the number of Picademy events and participants since 2014.

Table 1: Picademy 2014–2019.

		2014	2015	2016	2017	2018	2019	Total
UK	Events	6	13	15	11	4	2	51
	Participants	132	275	392	338	148	114	1399
North America	Events	0	0	5	8	9	10	32
	Participants	0	0	161	312	313	326	1112

Certified Educators are also invited to complete an annual survey to record any physical computing-based activities that they are engaged with in their settings. In this report, we examine the results of three surveys, from 2017 to 2019, and ask the question, "To what extent are Certified Educators engaged with physical computing in the years after their Picademy experience?"

What is Picademy?

What is Picademy?

Picademy ran as the Raspberry Pi Foundation's flagship professional learning programme for educators from 2014 to 2020. Picademy events take place over two full days and are designed to give educators an opportunity to develop their confidence and capability in computing. The experience focuses on creative and engaging ways to deliver digital making education with an emphasis on physical computing. On the first day, participants work through a series of hands-on workshops, each introducing new concepts, and gradually becoming more exploratory in nature. A prominent feature of a Picademy event is the digital making project on the second day, where participants apply what they have learnt. These typically collaborative projects serve as an opportunity for educators to experience the making process from the perspective of their learners. Through these projects, participants develop agency, and experience success and failure in equal measure, highlighting the pitfalls and the need for resilience.

Even when Picademy started in 2014, two days of professional development represented a significant investment of time on the part of educators and schools. It was important, therefore, that Picademy was free to attend and offered value for the educators participating. To maximise accessibility and support the participants in their digital making journey beyond Picademy, each attendee received a 'swag bag'. This included resources to support the event, including a Raspberry Pi computer, which educators could take away to continue learning.

Having completed the event and presented a project, participants earn the status of Raspberry Pi Certified Educator and are welcomed into a community of past alumni. Certified Educators receive both a physical and digital badge, which many wear or display with pride in person and on social media. This community connection facilitated ongoing conversations and support for educators and gave members a sense of belonging that has persisted. For many, the experience marked a significant moment in their journey as a digital making educator and has had a lasting impact.

Sustained engagement after Picademy

Sustained engagement after Picademy

The Raspberry Pi Foundation keeps in regular contact with Certified Educators, providing resources to help them to continue to develop their skills, and checking in with them each year to learn more about their challenges and teaching practices.

An educator forum is available to all Certified Educators so that they can stay in touch with each other and the Raspberry Pi Foundation. In the USA, a dedicated member of staff was recruited specifically to build the community of Certified Educators, providing regular check-ins for everyone in the community. In both the UK- and USA-based communities, there were opportunities to get involved in new initiatives, regular information sharing, and networking. Many new applicants to Picademy signed up because they had heard about the workshop from other attendees by word of mouth.

Annual survey

Annual survey

The Raspberry Pi Foundation sent annual surveys to all Certified Educators between 2017 and 2019. Some questions changed between surveys, but many have remained consistent for two or more surveys. This means that we are able to assess how Certified Educators' practice and context have changed in aggregate over different time periods since they took part in Picademy.

The survey questions explored the following themes:

- Participation and personal data
- Subjects taught and age of learners
- Opportunities to use the skills developed at Picademy
- Teaching approaches used
- Experience of sharing learning with colleagues

Reports were published describing the findings from the surveys in 2017, 2018, and 2019; this report focuses specifically on the level of engagement sustained over various time periods since the educators' participation in Picademy.

Findings

Findings

The three annual surveys received a total of 1525 responses, from 1254 individual Certified Educators, meaning that 271 Certified Educators completed more than one annual survey. Using the data provided by Certified Educators on when they took part in Picademy, we were able to assign each response to a cohort that represented the time elapsed since taking part. These groups were 0–12 months, 13–24 months, and 25–36 months.

Individual Certified Educators can appear in more than one cohort, reflecting the different time periods since their participation in Picademy, and we can capture how Certified Educators as a group continue to develop at different times following their certification.



Our six key findings are:

1. Certified Educators continue to apply what they learnt for several years after taking part in Picademy
2. The two greatest challenges reported by Certified Educators are a lack of funding for equipment and lack of time to plan creative activities
3. How Certified Educators perceive their impact on learners increases over time
4. Certified Educators continue to share what they learnt at Picademy with their peers, with many sharing in new ways as time goes on
5. Certified Educators engage with other Raspberry Pi Foundation programmes and resources
6. Certified Educators' confidence in applying different teaching approaches develops over time

Each of these is described in the following pages.

Certified Educators continue to apply what they learnt for several years after taking part in Picademy

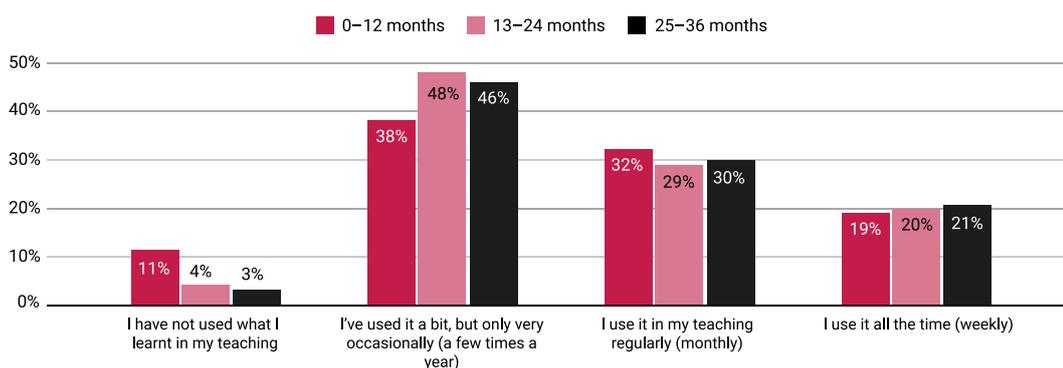
Educators face a number of challenges around professional development. In the UK, 51% cite a lack of time as a factor in not taking up professional development opportunities¹, and 49% of educators in the USA report that conflicts with their work schedule are a barrier². We also received feedback from Certified Educators that other professional development opportunities that they have attended have been difficult to implement in their setting. These factors mean that any professional development opportunities must represent a good use of time for educators, and must result in knowledge and skills that can be employed in the classroom.

Across all cohorts of Certified Educators, 94% reported using what they had learnt at Picademy in their teaching, and 50% reported that they used their new knowledge and skills every month or even more frequently. Among Certified Educators who had taken part in Picademy in the last 12 months, 89% reported using what they had learnt in their teaching. Among those who had taken part between 13 and 24 months ago, this figure increased to 96%.

Regardless of time elapsed since taking part in Picademy, around half of Certified Educators told us that they continued to use what they had learnt monthly or even weekly in their teaching, demonstrating that the knowledge and skills gained from Picademy have continued to serve educators as they continue their professional development. This aligns to research on the value of collaborative and sustained professional learning opportunities³.

Certified Educators reported sustained usage of what they had learnt at Picademy in their teaching, long after taking part

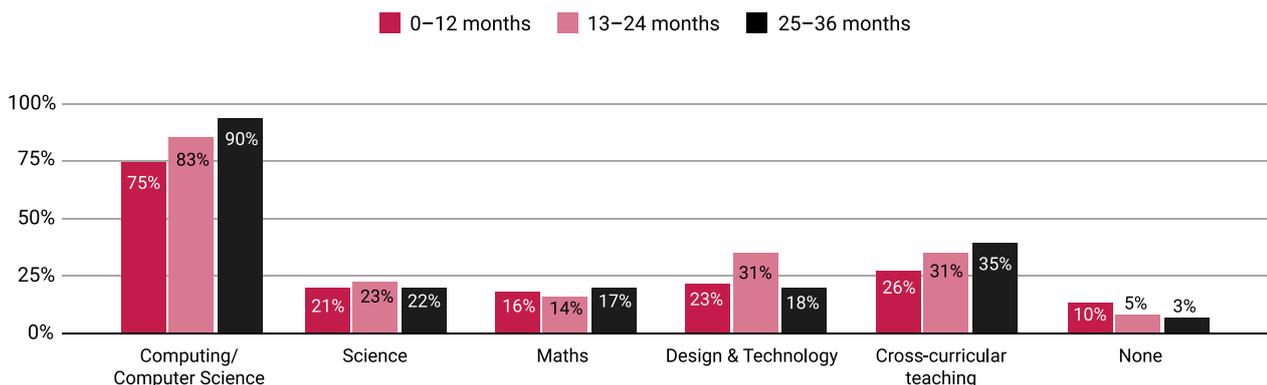
Responses to “How often have you used what you learnt at Picademy in your teaching?”



Many Certified Educators teach multiple subjects, and not all Certified Educators are computing or computer science teachers, so we also asked Certified Educators which other subjects they had integrated their learning into. Across all responses, 83% of Certified Educators had integrated their learning into computer science or computing, but many had also used knowledge gained at Picademy in design and technology (21%), science (23%), maths (15%), and cross-curricular teaching (30%). Giving educators skills that they can continue to develop and adapt in new contexts means that the benefits of taking part in Picademy can go beyond computer science or computing and into other subjects.

Many Certified Educators implement what they learnt across different subjects beyond computing or computer science

Responses to “Into which subject areas have you successfully integrated your learning from Picademy?”



How educators continued to develop their skills was also reflected in differences between responses from Certified Educators who had taken part in Picademy at different times. Certified Educators who had participated in Picademy in the last 12 months had integrated what they had learnt into 0.95 subjects on average. This figure rose to an average of 1.2 subjects and 1.4 subjects among those who had taken part 13–24 months ago and 25–36 months ago, respectively. This means that the average Certified Educator integrates what they learn at Picademy into more than one subject.

Certified Educators were very enthusiastic about the use of hands-on activities during the training. This feedback suggests that, for teacher training programmes more broadly, adoption into the classroom and

continued use can be kick-started by giving educators the chance to try out some practical activities. Showing teachers the range of possibilities available with a particular technology or technique means that they will then have the skills to apply that knowledge in a range of fields as they continue their professional development.

What is the best thing about Picademy?

“The hands-on activities were really fun and engaging, and gave an insight as to how the equipment we used could be transferred to the classroom.”

“The best thing about Picademy is that in two days, a learner with absolutely zero computer programming experience can learn enough basic programming skills to implement physical computing in the classroom.”

The two greatest challenges reported by Certified Educators are a lack of funding for equipment and lack of time to plan creative activities

A very high proportion of Certified Educators have been able to implement what they learnt at Picademy, but we also know that there are a range of challenges for educators in integrating physical computing into their practice. The landscape of computing education has changed since our first Picademy events in 2014, particularly in the UK, with changes to both the curriculum and the range and cost of available hardware, and we have seen some corresponding changes in the challenges reported by Certified Educators.

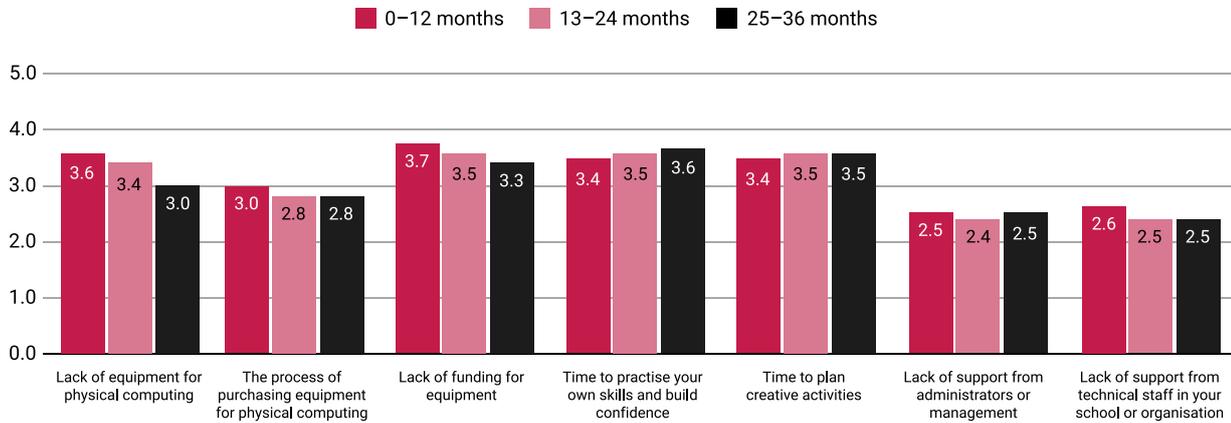
We asked Certified Educators to tell us how challenging they found certain aspects of teaching with physical computing, using a 1–5 scale where 5 represents “very challenging”.

Lack of equipment, and lack of funding for equipment, were consistently two of the greatest challenges for Certified Educators. Interestingly, however, Certified Educators who had taken part in Picademy more recently rated these as more challenging than those who had taken part more than a year ago. The 0–12 month cohort rated lack of equipment for physical computing as 3.6/5, compared to 3.4 among the 13–24 month cohort, and 3 among the 25–36 month cohort. Similarly, the 0–12 month cohort rated lack of funding for equipment as 3.7/5, compared to 3.5 among the 13–24 month cohort, and 3.3 among the 25–36 month cohort. This may imply that Certified Educators are more likely to petition their school to purchase equipment to use in their teaching the longer it has been since they attended Picademy.

Lack of time was cited as a challenge by many Certified Educators, and this was not rated differently by the different cohorts. Specifically, lack of time to plan creative activities and lack of time to practise their own skills and build confidence were challenges for Certified Educators in all cohorts. Similarly, lack of support from technical staff and from school administrators were rated as challenges that did not ease as educators continued their professional development following Picademy.

Challenges around having equipment available and funding seemed to reduce over time, but lack of time is a consistent challenge for all Certified Educators

Average of responses to “How challenging do you find each of the following?” where 1 = not at all challenging, 5 = very challenging



We recognise the challenges that educators face in implementing physical computing in their practice, but we are pleased to note that the challenge of purchasing hardware seemed to reduce over time for Certified Educators. This may be due partly to the release of new devices and tools over the last few years, making them more accessible and cheaper. Another factor may be that after an initial purchase and period of use, familiarity with the process of requesting funds and purchasing, as well as with the device and its usefulness, makes it simpler and easier to justify applying for further equipment.

Similarly, the experience of trying a range of different technologies at Picademy may help to demystify what can be a confusing landscape of devices and software for educators who want to use physical computing in their practice, and this may be generally applicable for other teacher training courses as well. In short, it seems that Certified Educators gain the confidence to choose which devices to use in their classroom after attending Picademy, which is reflected in the reported average decrease in the challenge associated with acquiring equipment.

What is the best thing about Picademy?

“Sharing experiences among other educators, and understanding the challenges they have faced and how they solved them, gave me new ideas and new approaches on how to work with my students.”

“Becoming part of the network of Certified Educators, so that you are never alone in trying to overcome challenges.”

How Certified Educators perceive their impact on learners increases over time

The Raspberry Pi Foundation aims to give more young people the opportunity to try physical computing and digital making, and we have asked Certified Educators over the years about the impact their activities have had on the young people they reach. On the whole, Certified Educators agree that the young people they reach have developed their skills, confidence, and interest in computing. We also found some interesting differences between the different cohorts of Certified Educators.

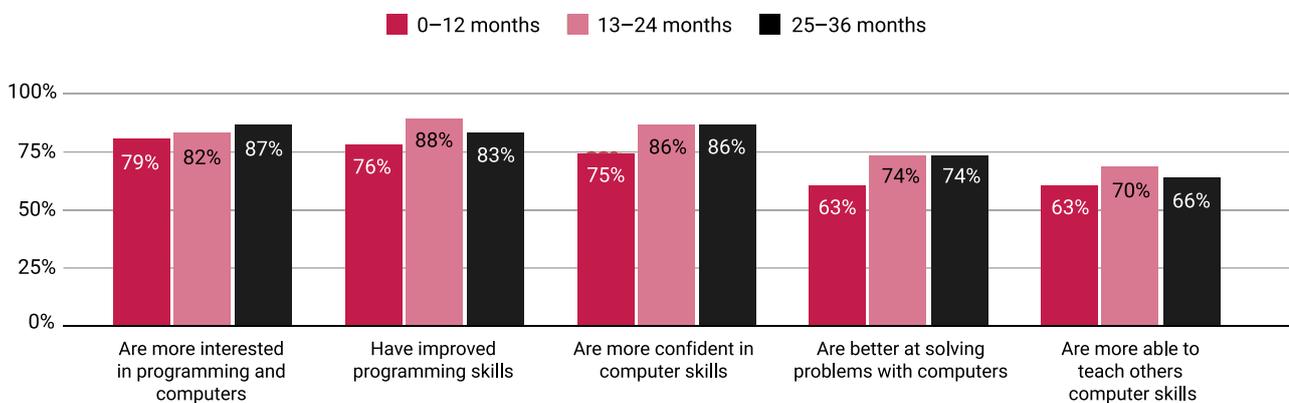
We asked Certified Educators to what extent they agreed with the following statements:

Since implementing what you learnt at Picademy, the learners you work with:

- Are more interested in programming and computers
- Have improved programming skills
- Are better at solving problems with computers
- Are more confident in computer skills
- Are more able to teach others computer skills

Certified Educators were very positive about their impact, and slightly more positive after the first 12 months following certification

Percentage who responded "Agree" or "Strongly Agree" to the below statements



Across all three cohorts and all five statements, the agreement rate was above 60%, demonstrating that overall Certified Educators feel positive about their impact on learners. However, across all of these statements, we found lower agreement rates in the 0–12 month cohort, that is, the cohort who had taken part in Picademy more recently. The agreement rate was higher among the 13–24 month cohort. As discussed in the first section of this report, implementation of the knowledge and skills from Picademy is a gradual process, as educators continue to develop their skills and confidence, and so it is unsurprising that Certified Educators feel more positive about the impact on their learners when more time has passed following Picademy.

That said, we saw a similar rate of agreement, rather than an increase, for the 25–36 month cohort compared to the 13–24 month cohort. Perhaps as time goes on, Certified Educators develop their practice in such a way that they are using techniques and tools beyond what they learnt at Picademy, and the direct impact of what they learnt becomes less obvious.

What is the best thing about Picademy?

“I really liked the fact that all the activities were hands-on and that we were able to take the equipment home and use it immediately in the classroom, giving us a direct impact on our students.”

“I work with teachers, so while I can’t quantify the impact on students, we have greatly increased the creating and making due to Picademy. Additionally, our staff are more likely to take some risks in the classroom and hand over learning to students. This is huge when trying to reframe teaching to be student-led.”

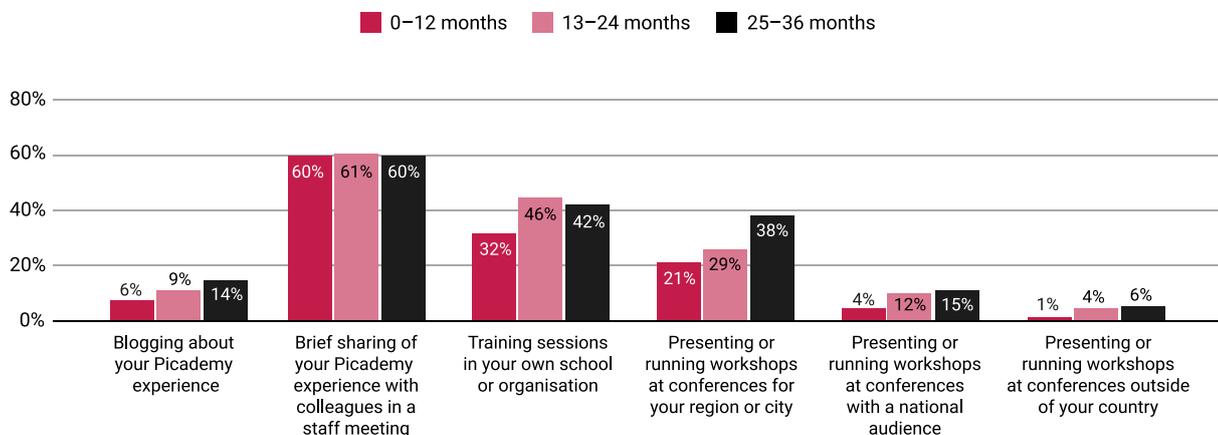
Certified Educators continue to share what they learnt at Picademy with their peers, with many sharing in new ways as time goes on

We encourage learners at Picademy to share what they have learnt with their peers, and the hands-on nature of the training means that Certified Educators can demonstrate and develop the ideas that they explored over the two days by sharing their knowledge with other educators. Many Certified Educators told us that the collaborative nature of Picademy was one of the best things about it.

We asked Certified Educators how they shared what they had learnt, for example, through blogging, sharing informally or formally with their colleagues, or sharing with larger groups at events or conferences.

As time passed following certification, Certified Educators were more likely to share what they had learnt via workshops or conferences

Responses to “How have you passed on what you learnt?”



We found that as the time since participating in Picademy increased, learners were more likely to have used more ways to share what they had learnt. Across all three cohorts, Certified Educators were equally likely to have shared what they had learnt in a staff meeting with colleagues, suggesting that this was something that Certified Educators were likely to do relatively soon after taking part. Similarly, 32% of Certified Educators in the 0–12 month cohort had run training sessions at their schools, whereas among those who had taken part in Picademy 13–24 months ago, this figure was 46%, suggesting that this method of sharing was likely to be used later.

We also asked Certified Educators about sharing what they had learnt through conference presentations, either locally, nationally, or outside of their country. While a lower proportion of Certified Educators had done this, we found that as time went on following Picademy, the proportion of Certified Educators presenting at conferences increased.

Together, these findings demonstrate that the majority of Certified Educators take the time to share what they have learnt with their colleagues, at least informally. As they continue to develop their skills, and as time progresses following their participation in Picademy, they are more likely to share more widely, running local training sessions or presenting at conferences. These changes in the way that Certified Educators are sharing their knowledge suggest a continuing development of their skills long after taking part in Picademy.

If educators feel confident and enthusiastic about sharing what they have learnt, it means that the training can reach more educators and have a greater overall impact. Giving educators the skills to implement what they have learnt quickly may help develop confidence and foster an interest in sharing knowledge, which in turn helps educators to continue their professional development.

What is the best thing about Picademy?

“Sharing ideas with other teachers.”

“Picademy is fantastic for networking with other educationalists who are introducing digital making to their school, be it in lessons or extracurricular activities.”

“Getting to know a wide range of educators, be it class teachers, Code Club volunteers, or college staff. It’s great to see how everyone uses digital making in different ways.”

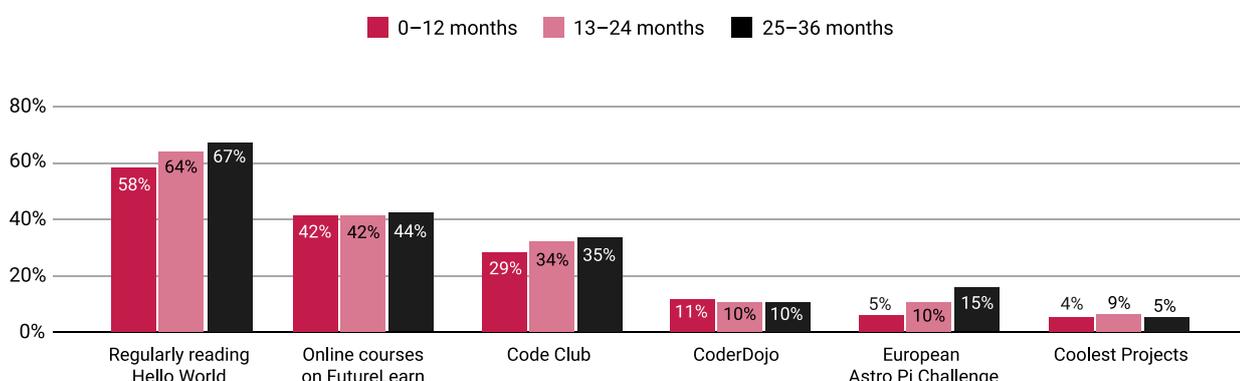
Certified Educators engage with other Raspberry Pi Foundation programmes and resources

At Picademy, information about other Raspberry Pi Foundation programmes is shared with Certified Educators. In particular, they are told about opportunities to continue their professional development via our free online courses and Hello World, our free magazine for computing educators, and they are told about opportunities to share what they have learnt with young people in non-formal settings such as Code Club or CoderDojo. Some Certified Educators attend Picademy having already been involved in these opportunities, whereas for others, Picademy is their first interaction with the Raspberry Pi Foundation.

When we asked Certified Educators whether they had taken part in other Raspberry Pi Foundation programmes, we found differences between cohorts. For example, 28% of Certified Educators who had taken part in Picademy in the last 12 months were involved with Code Club, and this figure rose to 34% among the 13–24 month cohort. Also, a small subset of Certified Educators had taken part in the European Astro Pi Challenge (the project that we run in collaboration with the European Space Agency, in which young people write computer programs that run aboard the International Space Station), and the proportion taking part in this project grew with each cohort.

Certified Educators also engage with other programmes and resources from the Raspberry Pi Foundation

Responses to “Which Raspberry Pi Foundation programmes have you taken part in in the past year?” and “Do you regularly read any of the following?”



Participation in our free online courses was also fairly high: 42% of the 0–12 month cohort had taken part, and similar participation rates were observed among the other cohorts. This suggests that taking part in our online courses may be something that Certified Educators do as a next step following Picademy.

What is the best thing about Picademy?

“Picademy gave me the confidence to move forward with teaching programming. I left with the skill set to start an introductory program and have felt supported by the Raspberry Pi Foundation since.”

“I have achieved my goal to become a CoderDojo Champion, working with people on the autism spectrum and their families.”

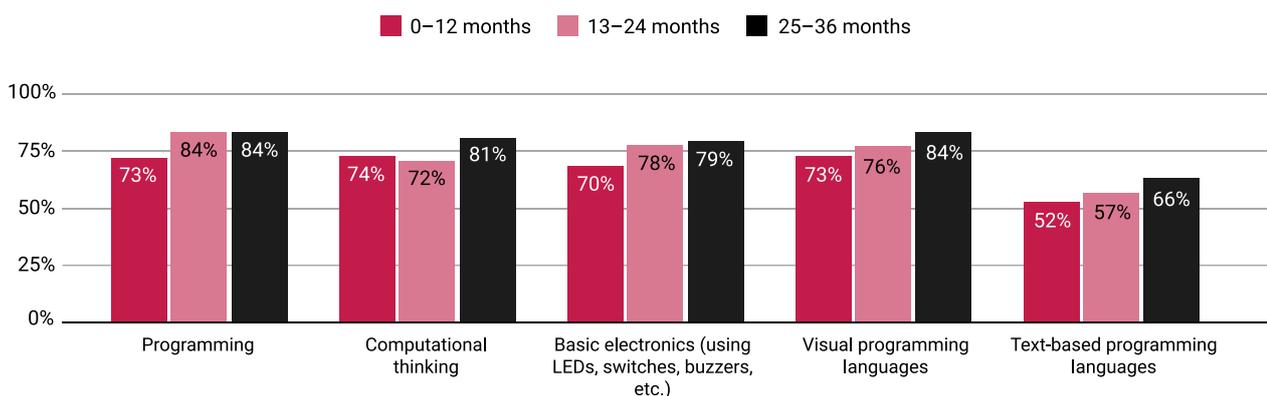
Certified Educators' confidence in applying different teaching approaches develops over time

We asked Certified Educators about their confidence in teaching different concepts and tools, some specific (e.g. using text-based languages) and some more general (e.g. programming). Almost all Certified Educators attended Picademy with some prior experience of teaching computing, but many were relatively new to the subject at the time of certification. We were interested in how their confidence to teach different concepts and tools had changed over time since their certification.

Across almost all categories, we observed a general pattern of increasing self-reported confidence in all cohorts as time passed following their Picademy attendance. This pattern was most pronounced for confidence in using visual or block-based programming languages, and in using text-based programming languages. Certified Educators also reported a higher confidence level in teaching programming and computational thinking as time passed following Picademy.

Over time, Certified Educators' confidence in teaching different concepts tends to increase

Responses to "Which of the following topics do you feel confident to teach to young people?"



We know that Certified Educators engage with other Raspberry Pi Foundation programmes and resources, and while we can't attribute increases in confidence to any specific factors, we suggest that the engagement of educators in a community has helped to increase their confidence in the work that they do.

Conclusion

Conclusion

This report demonstrates that, for many educators, the experience of Picademy has had a long-term impact on their engagement with digital making. There are a few considerations to mention: firstly, we do not know what other professional learning the educators completing the survey had also participated in since their engagement with Picademy. However, ad hoc reports suggest that the positive experience of Picademy has inspired some educators to continue to find out more by signing up to other professional learning opportunities, which is very positive and aligns with our commitment to lifelong learning. Secondly, we did not discuss here the ratio of applicants to participants, but there was much more competition for places in the early Picademy workshops because of very high numbers of applicants, so it may be that those attending early Picademy events were particularly motivated and engaged.

The Picademy model aligns with research on professional development that shows, again and again, that key elements of effective professional development are collaboration and sustainability. Thus, the story of Picademy points to a successful approach to professional learning with the particular features:

- The event itself is based around collaborative activities, is a lot of fun, and offers opportunities for intense skill and knowledge building for educators from a wide range of backgrounds
- Socialising opportunities within the two-day event enable participants to form bonds and grow connections
- Receiving a physical badge and entrance to a community of like-minded educators attaches value to the experience and potentially boosts confidence
- Sustained communication and contact with the Raspberry Pi Foundation gives Certified Educators a feeling of belonging to a community and empowers them to further develop their skills and knowledge

We hope that this report and our learning are useful to those implementing similar professional learning opportunities in computing and digital making around the world.

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