

# Science and Mathematics Specialist Centre



## Annual Report 2023

GTAC: The Gene Technology Access Centre



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## INTRODUCTION

The Science and Mathematics Specialist Centres provide access for Victorian schools to high quality learning programs through on-site, online and out-reach delivery modes. The Centres have an equity focus on rural/regional and disadvantaged metropolitan government schools. The Annual Report provides succinct information about each Centre's performance and planning.

### FROM THE DIRECTOR

The demand for GTAC's STEM education programs from schools across Victoria remained high in 2023 with our onsite programs being filled within 24 hours of releasing our program offerings. We had 15,737 Victorian students participate in our programs. 46% of participants were from rural government schools and 30% from high SFO schools. Our commitment to equity has resulted in development of new fully subsidised outreach programs for Victorian disadvantaged schools. Through delivery of STEM kits into schools for 6,503 students, we have increased outreach by more than 150% compared to previous years.

To maintain our reputation in delivery of high-quality STEM programs we continue to explore ways we can raise students' interest and engagement in STEM. In our GTAC Professional Learning Community (PLC) we collaborated with EdPartnerships International to focus on our goal to activate student agency in STEM. There has been a paradigm shift in how we design and deliver our new STEM education programs. We have developed our GTAC commitments to learner agency (**appendix 5**); we have visited schools to collect student and teacher voice data and use this to inform program design; and we have designed 5 new programs to activate student agency (years 5 – 10):

1. *Micro and Nano World explorers* STEM kit for secondary students – a partnership with Inspire STEM Education
2. *Forensic investigations to solve an environmental crime* – a program for year 9&10 students based on a current court case. This program provides students with multiple pathways for examining evidence to investigate the case.
3. *Tackling the pollination problem* – a new primary program for year 5&6 students has an online component, a school incursion, and a design expo at GTAC where students explore challenges for pollinators and current solutions and design their own solutions to support pollination.
4. *One Health Heroes* – A new primary program for years 5&6 students where student voice identifies an issue to explore in a school community. Teachers are supported with videoconferencing, STEM kits and incursions to their school to complete this unit.
5. *Dark Matters* – A new collaboration with the Science Centre of Excellence, Science Gallery Melbourne. Disadvantaged years 7&8 students attended the gallery installation and then participated in an escape room and wet lab activities at GTAC to explore the gut biome.

We collaborated in our PLC to develop a new *GTAC Scientist Mentor Playbook* with strategies to improve the use of questioning to foster student dialogue. Our mentors are practicing scientists who teach groups of 6 students in our programs. All scientist mentor shifts now include a paid training segment to raise their readiness to teach and their impact on student learning. Data collected shows us this initiative is impacting mentor readiness and affect in their work with students.

I am immensely proud of the GTAC team. They continue to innovate with pedagogies and technologies to improve the student experience in our programs. This is an incredibly talented and dedicated team who reap the rewards of their work when they see students enjoying STEM. Through this report you will see the impact GTAC continues to have in raising STEM education across Victoria.

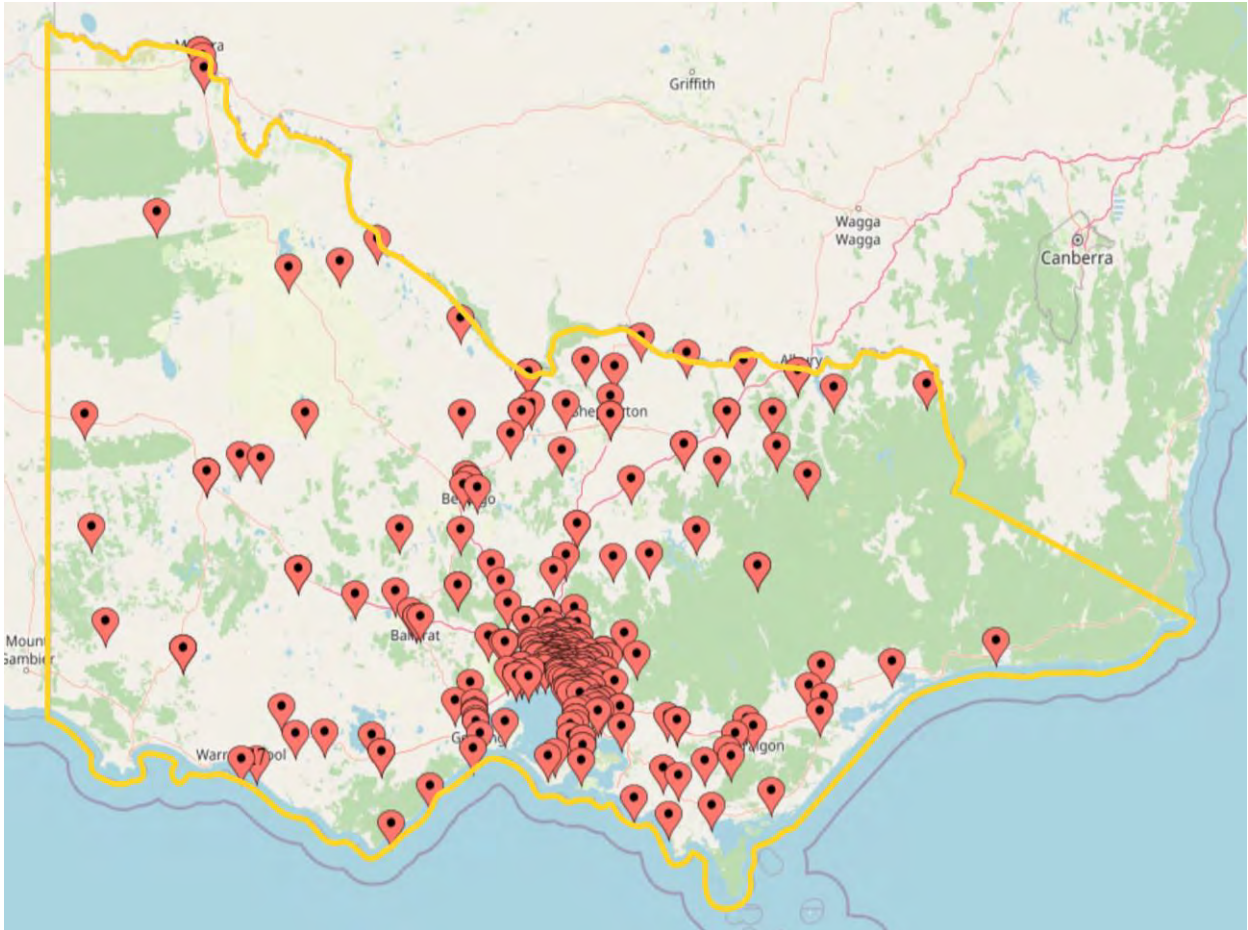


## PROGRAMS

### Our reach in 2023:

A total of 368 Victorian schools participated in an onsite or outreach program with GTAC in 2023:

- 190 (54%) of Victorian secondary schools
- 101 (41%) of Victorian P-12 schools
- 66 (4%) of Victorian primary schools



**Diagram 1:** Heat map of Victoria showing the reach of GTAC programs across the state

#### **Student unsolicited email:**

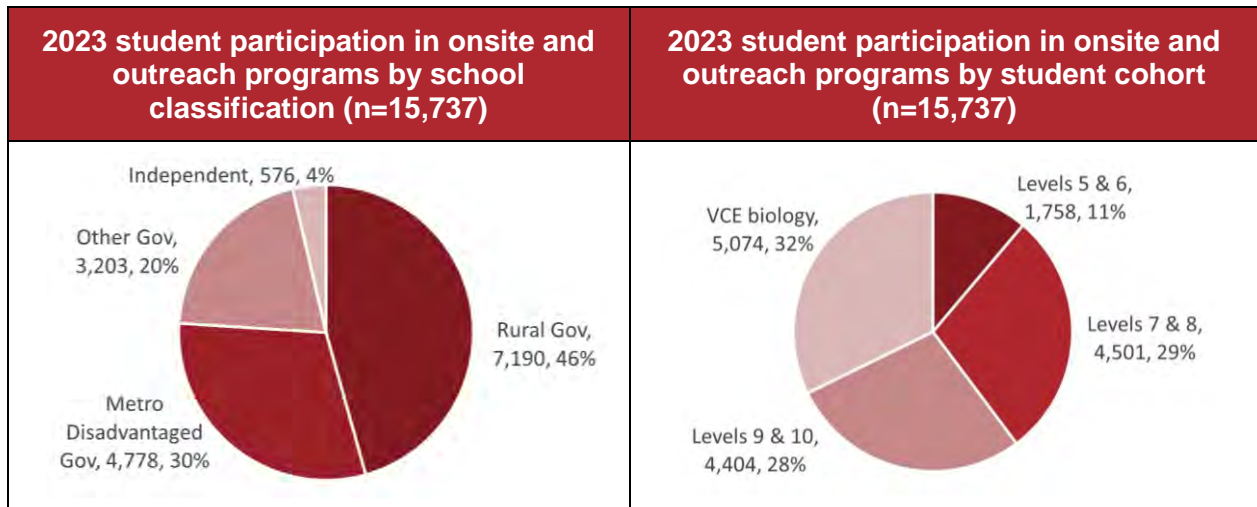
*I would like to deeply express my appreciation and gratitude for the opportunity to complete Work Experience at GTAC. I have significantly enjoyed the past 4 days meeting new people with similar interests and conducting experiments alongside them, helping my knowledge grow in areas of genetic science using CRISPR. This experience has helped me improve and develop lots of transferable skills which will help me pursue a future in STEM.*

#### **Teacher unsolicited email:**

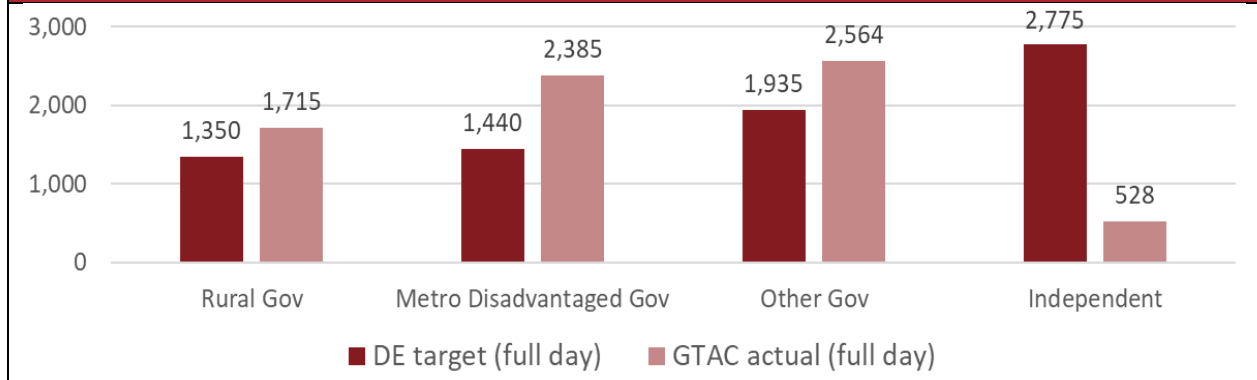
*It is fantastic news that we have access to the "design a bionic arm" program again in 2023. The student and teacher feedback from 2022 was extremely positive. One student said that it had changed his ideas of what he wanted to do*

### Student participation in GTAC programs:

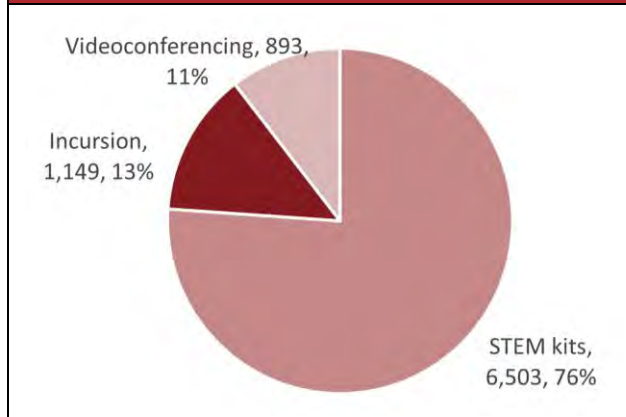
We exceeded both our onsite and outreach targets in 2023, providing 15,737 onsite and outreach learning experiences for Victorian students, and 52,489 verified online learning experiences.



### Onsite participation 2023 against DET targets Total GTAC onsite = 7,192



<h3>Outreach delivery mode 2023 Total GTAC outreach = 8,545</h3>	<h3>80 GTAC Scientist Mentors support student learning at GTAC in 2023 - including 45 new recruits</h3>
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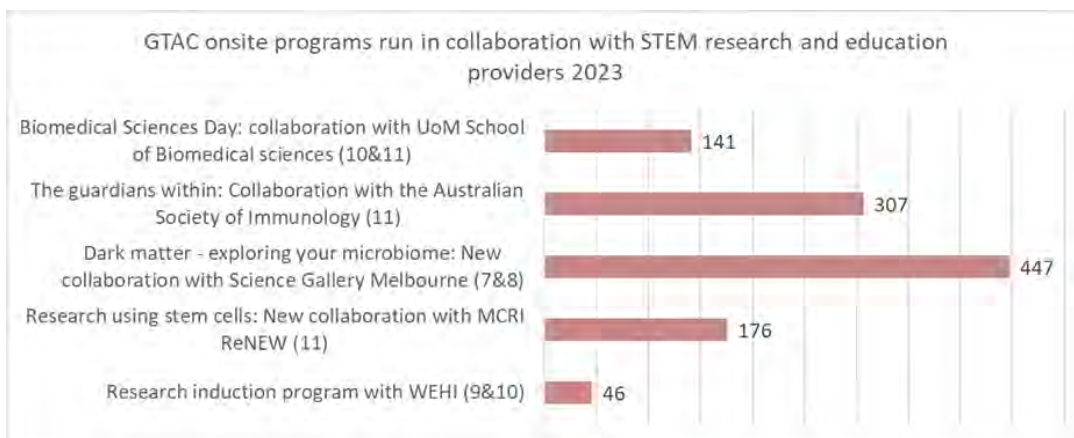
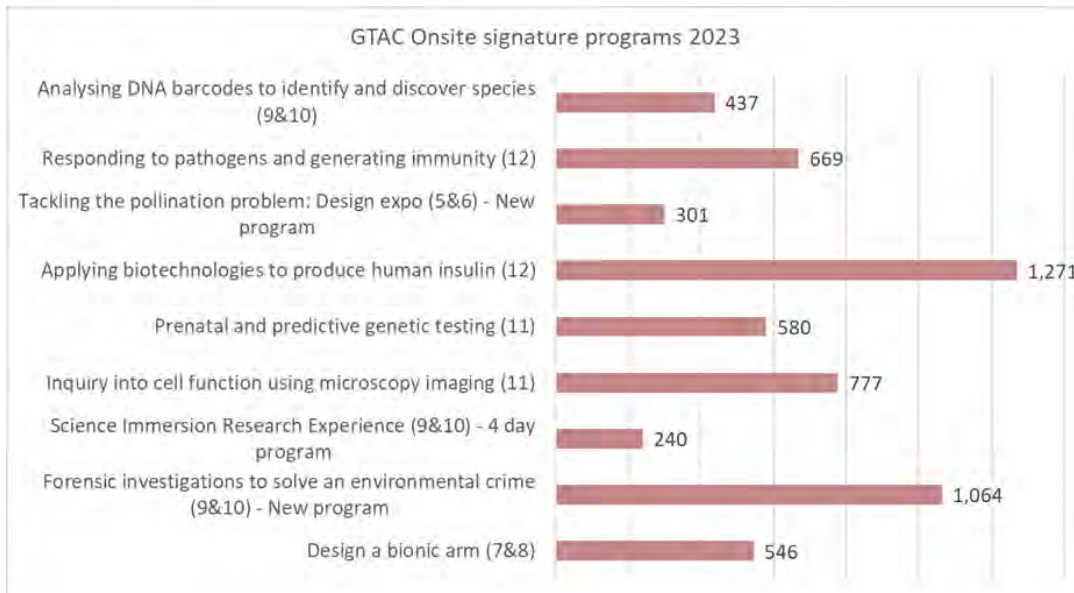
### GTAC 2023 program participation profile:

At GTAC we provide opportunities for students to practise STEM skills through authentic engagement with ideas, issues, and careers in the life sciences. Our programs support schools to implement the Victorian F-10 and the VCE Curriculum through provision of pedagogical and scientific expertise, and application of emerging technologies. Students are inspired in STEM studies and careers through engagement with practising scientists. In our face-to-face programs, students work in groups of six guided by our GTAC scientist mentors, PhD research students employed on a casual basis. We continue to grow and evolve our programs in response to the needs of Victorian schools and our strategic goals:

1. To activate student agency in STEM
2. To foster students' curiosity and confidence in STEM
3. Every student feels safe and included in learning.

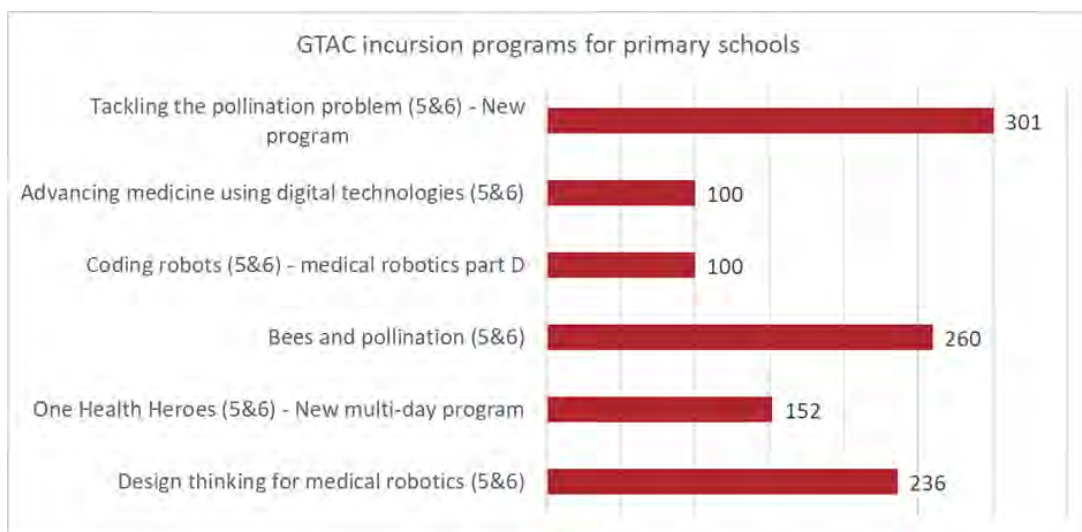
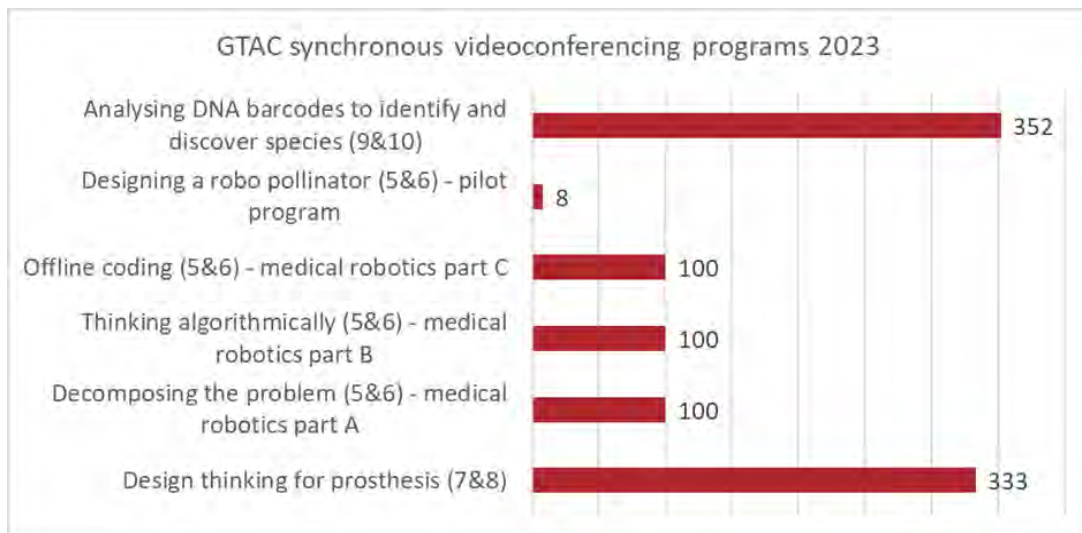
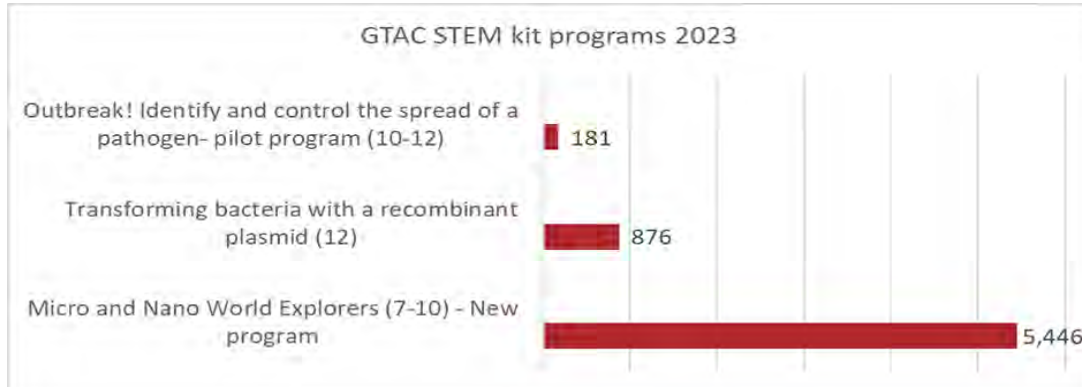
### Student participation in onsite programs

Our 2023 onsite programs are listed below indicating year level and participation rate, new programs designed to meet our strategic goals, and programs run in collaboration with STEM research and education providers.



### Student participation in Outreach programs:

Outreach programs are designed to meet the needs of disadvantaged schools through providing incursions, videoconferencing, and STEM kits free of charge. In 2023 we expanded our STEM kit and incursion program offerings with a focus on activating student agency, and in response to schools having difficulty coordinating excursions, due in part to increases in travel costs and shortages of teachers.



**Student participation in GTAC online programs:** [www.gtac.edu.au](http://www.gtac.edu.au)

Virtual learning resource type	Number of resources available online	Times accessed by or delivered to a learner worldwide	Times accessed by or delivered to a learner in Victoria
Animations and videos	19	156,240	Data not available*
Downloadable classroom activities and practical investigations	71	20,160	19,091 <sup>Δ</sup>
Online student courses	45	34,822	32,976 <sup>Δ</sup>
Interactives (Thinglink)	150	4000	Data not available*
Educational games	3	732	422 <sup>Δ</sup>
<b>Total</b>	<b>288</b>	<b>215,954</b>	<b>52,489</b>

**Key:** \* Numbers could not be verified as VIC school students due to Google Analytics data collection methods  
<sup>Δ</sup> Verified VIC school students

Our online program provision increases our reach beyond our face-to-face program offerings and aligns with our strategic focus to improve our capacity to use technology to support engagement and inclusion for all students (years 5 – 10). We have a strong presence in the VCE biology sector and are now working towards expanding our presence in the primary sector. A [new primary student course](#) was added in 2023 to augment our *Tackling the pollination problem* program. This includes a segment on [design thinking](#) to support teachers and students in the process of designing a solution or product for a specific problem. It provides descriptions of each stage in the design thinking process and thinking tools and graphic organisers to support each stage.

**Program highlight: One Health Heroes - pilot program for year 5 & 6 students**

This program empowers students to become agents of change in their community by proposing practical and sustainable solutions to One Health challenges.

One Health focuses on the interconnectedness of human, animal, and environmental health. Through the lens of the One Health approach, students engage in real-world problem-solving using the design thinking framework. The program supports students to identify, investigate, and propose solutions to health-related issues in their community, fostering skills in science, collaboration, and critical/creative thinking. One Health Heroes aims to inspire and equip the next generation of leaders and innovators with the skills and knowledge needed to create a healthier and more sustainable future for all.

**Key program components:**

- **Design Thinking Framework:** Students apply the design thinking process to develop innovative solutions to challenges in their community.



- **Science Skills:** Students explore their surroundings using specialised equipment to conduct investigations and collect data to inform their problem-solving process.
- **Collaboration:** Students work collaboratively in teams, learning to communicate effectively, share ideas, and leverage diverse perspectives to achieve common goals.
- **Critical and Creative Thinking:** Students refine their critical and creative thinking skills as they analyse problems, generate ideas, and evaluate potential solutions based on evidence and reasoning.
- **Tailored Program:** The program is tailored to each school's individual needs and scheduling requirements, ensuring flexibility and relevance to the local community.
- **Mixed Delivery Mode:** One Health Heroes is delivered via a mixture of videoconferences, online teacher resources, face-to-face incursions, and provision of a STEM kit left at the school for 2 weeks. This provides a comprehensive and engaging learning experience.
- **Team Teaching:** We provide professional learning to empower teachers to co-deliver this inquiry program.

**Unsolicited email from teacher coordinator at the pilot school:**

*Thank you for the incredible incursion a few weeks ago. The grade 6 students loved the experience. The students had the opportunity to work with real scientists, use advanced equipment and experience the micro-universe with your support. They have continued with their research using the equipment that you left. It has become so popular that I have been running lunch-time excursions to the creek to keep up with the demand! Students are developing their ideas about how we can help to improve the health of the creek, either through campaigning or developing an invention. I am keen to work with GTAC again next year. It has really engaged the kids and hopefully is the first step for some in a career in science! - Melton PS teacher*

**Reflections from primary students at the pilot school:**

*After our incursion, I created a water filter prototype to try and reduce the microplastics in my local waterway to improve the health of the creek and increase the amount of macroinvertebrates. - 5&6*

*Looking at the water mites made me feel like I was a scientist discovering a new species. I was so surprised at how everything is connected to our local creek, and that the health of one thing can impact on so many other things, even me! - 5&6*

**IMPACT**

GTAC has a performance measurement framework that provides qualitative and quantitative data on programs through:

- Student satisfaction surveys: Total 1,273
- Teacher satisfaction surveys: Total 125
- Program case studies developed through interviews with teachers and/or students.
- Staff applying “Observing to learn” measurement tools during programs.
- Booking system data

This data is reviewed and used for program improvement and reporting throughout the year. The teacher and student satisfaction data for VCE, levels 7 - 10, and primary cohorts is provided in **Appendix 2** of this report.

**What our teacher survey data tells us (based upon a 5-point Likert scale):**

- i. 100% would recommend GTAC student programs to teachers in other schools.
- ii. 99% rated their interest in what they learned as high to very high.
- iii. 99% rated their enjoyment of the program as high to very high.
- iv. 99% rated the presentation of the program as high to very high.
- v. 99% rated their satisfaction with the program as high to very high.
- vi. 97% rated their students' enjoyment of the program as high to very high.
- vii. 92% rated their students' engagement with GTAC Scientist Mentors as high to very high.

**What our student survey data tells us (based upon a 5-point Likert scale):**

- i. 86% rated their interest in what they learned as high to very high - of note here is the lower interest reported by years 7-10 students (78%) compared with our primary (90%) and VCE (87%) cohorts.
- ii. 85% rated their enjoyment of the program as high to very high.
- iii. 87% rated the presentation of the program as high to very high.
- iv. 89% rated their satisfaction with the program as high to very high.
- v. 95% rated their engagement with GTAC Scientist Mentors as high to very high.

A measure of GTACs impact in the Victorian education community is communicated through student and teacher testimonials, and reasons teachers book and recommend our student programs. The reported driving influences in 2023 were:

- To access research grade technologies and equipment
- To raise student interest in STEM
- To access engaging real-world learning experiences and Scientist Mentors
- Positive experiences of GTAC programs
- High quality programs and instructors
- Links to curriculum and school coursework
- Great feedback from students on learning and engagement in previous years
- Recommendations from colleagues
- Hands-on practical experience connecting theory to real-life practice
- Wanting to provide a Science week experience

***Unsolicited feedback from teachers:***

*We had an amazing day and loved all that you offered. I know that I was excited to see how you added choice to all your "How can we" questions. It was a fantastic day for the students and great PD for the staff. - Anderson Creek PS teacher*

*Just wanted to send a quick email to say a MASSIVE thank you to your team, for setting up and running 2 highly engaging days for our Grade 5 students. They have come back 'buzzing' with ideas and it has really illuminated their interest in STEM, way beyond what we can offer back at school. We'd love to continue the partnership and please keep in touch. - Bellbridge PS teacher*

Our students (and teachers) have been having a blast with the SEM! As we are a P-12 we gave all our 5-10 classes a session with the SEM. I had a year 5 student say that it was the best science class ever (and year 5's are a tough crowd 😊) – P-12 teacher.

Thank you so much for hosting us at GTAC and conducting the Bioinformatics virtual session. The students loved having the opportunity to learn new skills and to work like real scientists. Your support of Science in Secondary Schools is outstanding, and I really enjoy working alongside you and your programs. – Secondary teacher.

### **Student and teacher testimonials from satisfaction surveys:**

#### **Teacher testimonials**

*The quality of the program and the technology being made available to students is invaluable to provide real world experience for science – VCE.*

*Highly engaging and motivating for students. Challenging them in biological technique and thinking – VCE.*

*Mentor scientists were exceptional and a pivotal part of the day – VCE.*

*Loved the new case study and the exposure to a real crime investigation, and the STEM inquiry focus incorporated into the program – 9&10.*

*It enriched students' learning experience with new knowledge and skills and has inspired us to use aspects of this program back in the classroom – 9&10.*

*Students have really enjoyed the hands-on aspect of this design a bionic arm program. The interdisciplinary nature of the application is important for them to experience – 7&8.*

*Students were highly engaged through hands-on activities, and teamwork in small groups with mentors – 7&8.*

*Students had hands-on experiences, a choice in how they can learn, and used equipment and technology that they don't have access to in the*

#### **Student testimonials**

*You are included in every activity. There is not a time where you are stuck listening, it's more hands-on and skill focused. If you enjoy biology, it is a must to go to GTAC – VCE.*

*I loved this program, I really enjoyed working together with my group and I actually learnt a lot. I was quite behind when I first came in and I learnt so many new things about genetics – VCE.*

*It was a great way to learn about genetics from scientists that work in labs and are doing their own research – VCE.*

*I really enjoyed it - maybe research is the path for me – VCE.*

*Work experience at GTAC was definitely one to remember. I enjoyed learning about genetics and surrounding myself with like-minded people, creating new friendships. I would love to do this again if I could – 9&10.*

*Not enough time there, I was so engaged in the process I wanted to look for more. Absolutely amazing! – 7&8.*

*Fun and exceeded my expectations. It was a fun activity which made us gather information, link them to one another and*

## PARTNERSHIPS

### Founding Partners:

Our founding partners are the *Walter and Eliza Hall Institute of Medical Research* and *The University of Melbourne department of Microbiology and Immunology*. GTAC engages formally with our partner organisations through the GTAC Advisory Board who elevate the Centre’s position within the broader educational and scientific community, and provide industry, tertiary and local government insight and advice on the Centre’s programs and directions.

### Collaborators:

Collaborators supported GTAC to provide **5 special event programs** for teachers and students in 2023. These programs showcase entrepreneurial pursuits and convergence of STEM in the life sciences in Victoria and expose students and teachers to:

- pathways to STEM careers
- workshops showcasing STEM research and innovations
- site visits to view STEM experts at work
- STEM experts presenting and sharing their knowledge, skills and research discoveries
- STEM experts collaborating on research projects with students
- Public STEM events

We forged several new collaborations in 2023 to co-develop and co-deliver new programs. A snapshot of two example follows here, and a separate example is provided as a case study in **appendix 1**.

### Dark Matters program: Collaboration with Science Gallery Melbourne for Science Week

To celebrate science week, GTAC established a collaboration with the Science Centre of Excellence (SCoE) at Science Gallery Melbourne to provide a program to 447 years 7–9 students from disadvantaged schools. At SCoE students interacted with the current Dark Matters exhibit at Science Gallery Melbourne and they participated in STEAM activities related to this exhibit.

At GTAC our “*dark matters*” subject was the microbiome. Students entered an escape room and used STEM technologies to solve clues related to the microbiome of the gut. In our laboratories, they stepped into the shoes of behavioural scientists to research how the microbiome can affect mental health and wellbeing, analysing mouse videos to compare control and test groups and discuss if a chemical released

by a specific gut microbe has an impact on anxiety. They also prepared a faecal transplant using healthy rat droppings (mock up) to explore an emerging medical treatment to restore a healthy microbiome in patients.



## Getting to the heart of it: A new collaboration with ReNEW stem cells MCRI

**Getting to the heart of it: using stem cells to understand heart health and disease** was held on Friday 10th March 2023 in partnership with [ReNEW](#) (Novo Nordisk Foundation Center for Stem Cell Medicine). The event was run as part of UniStem Day - the largest educational outreach initiative on stem cell research across the globe. A total of 180 secondary students and their teachers from 15 Victorian schools participated. 17 reNEW Melbourne members participated in the organising and running of this event.



The event provided students with a deeper understanding of the ‘real science’ of stem cell research and what it holds for the future, with a focus on the heart. Students had conversations with researchers from the Murdoch Children’s Research Institute, learning about their career, which part of the heart they are studying, and how they hope to help children with heart disease.

Students then engaged in an expose showcasing how stem cells are used to study heart development and disease:

- **Bioengineered heart patch** - Cardiomyopathy is a disease of the heart muscle that makes it harder to pump blood. Can a heart patch made from stem cells act as a biological band aide to preserve function?
- **Bioengineered heart valve** - Bacterial infection can cause Rheumatic heart disease where the heart valves are damaged. Investigate if heart valves made from stem cells or from pig pericardium are the best replacement valve options for a baby, child and adult.
- **Cardiac organoids** - Students explored how the use of the simplistic phrase “mini-heart” to describe lab-grown models of heart cells (cardiac organoids) might be misleading. They viewed a cardiac organoid using a fluorescent microscope to identify the different types of heart cells it contains.
- **Cardiac disease and genes** - Students used an online program designed by Monash University called [3D-Cardiomics](#), to explore gene expression profiles and identify which one of three proposed genes is likely causing heart disease in a patient.
- **Consent in iPSC research: what would you like to know?** - Students were introduced to a scenario where they have been asked to participate in stem cell research – all they need to do is give a blood sample. In a facilitated discussion, they explored what questions they would ask of the researchers and ranked their importance. Students gained an understanding of the informed consent process in research.

## STAFFING

Our 2023 staffing profile consisted of 10.2 Equivalent Full Time staff and up to 80 casual staff:

**Director (1 FT)** – Provides strategic oversight of Centre operations, develops and maintains strategic partnerships, reports to stakeholders and leads the implementation and evaluation of STEM education programs

**Deputy Director (1 FT)** - Supports the Director in the management of the facility, in developing and maintaining strategic partnerships, and leads program implementation and evaluation.

**Education Officers (5 x FT + 1 x 0.8 TF)** - Collaborate to design, develop, deliver and evaluate face-to-face and virtual STEM education programs for students and teachers. Liaise with STEM institutions to enhance programs and provide a connection between schools and industry.

**Laboratory Manager (1 FT)** - Provides technical and laboratory expertise to support the design and delivery of education programs. Oversees procurement and maintenance of scientific resources and equipment in line with DET policy.

**Administration manager (1 FT)** – Coordinates the client interface and client bookings. Maintains participation data and levies program charges in collaboration with UHS administration.

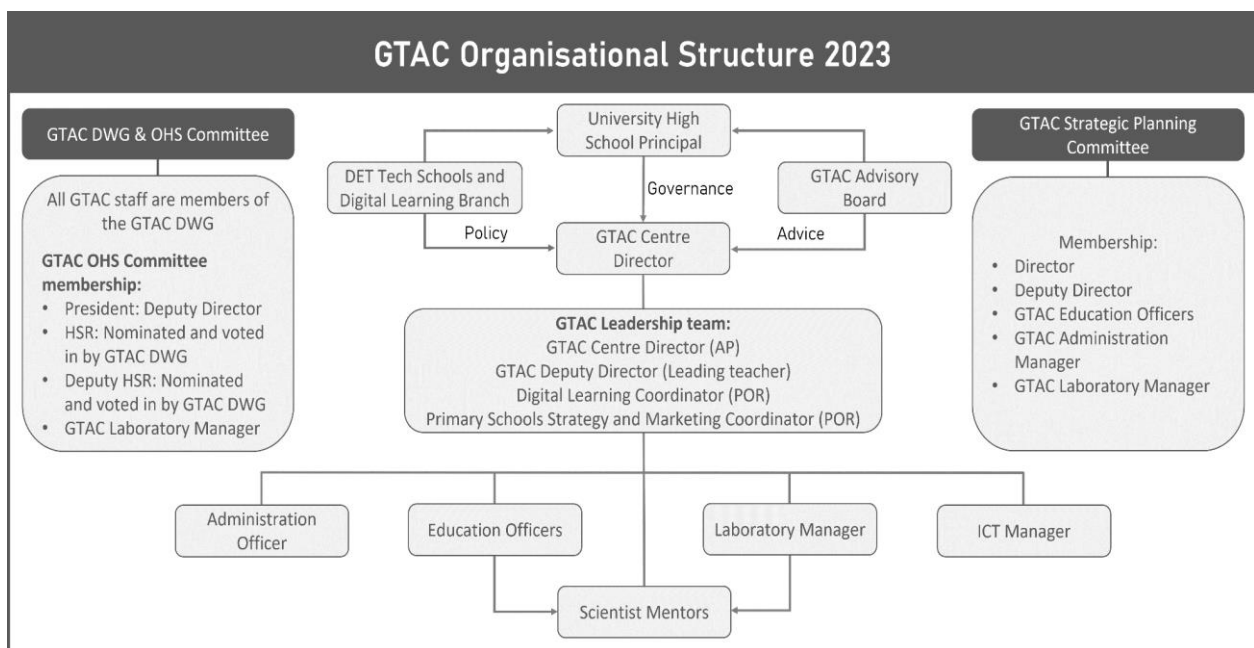
**ICT manager (0.4 TF)** – Supports delivery of the education programme and administrative workflows through effective integration of ICT and digital technologies.

**Up to 80 GTAC Scientist Mentors (casual staff)** - GTAC invests in recruiting and training PhD research scientists to guide small groups of 6 students as they carry out STEM investigations.

**GTAC supports host school administration of the Centre through provision of:**

- 5% of the Principal salary
- 5% of the Business Manager salary and
- A full time ES3 salary.

**GTAC Organisational Structure 2023:**



## FINANCIAL

Reporting for the year ending 20th January 2024 – see appendix 4 for Chart of Accounts

Department of Education **CAP funding allocation:** **\$1,580,440**

- 60% Credit: \$ 948,264

- 40% cash: \$ 632,176

GTAC operational expenditure in 2023:

- Credit (salaries): \$ 948,264

- Cash to credit (salaries over credit): \$ 289,365

- Cash expenditure: \$ 513,067

- **Total operational expenditure:** **\$1,750,696**

GTAC Revenue 2023:

- DE cash allocation: \$ 632,176

- DE repairs & maintenance allocation: \$ 28,163

- VCES grant & CRT from academy: \$ 102,349

- Teacher PL and SR student fees: \$ 39,651

- **Total 2023 revenue:** **\$ 797,360**

Total GTAC operations 2023:

= ( \$948,264 (credit) + \$797,360 (Cash) ) less \$1,750,696

= \$1,745,264 - \$1,750,696

**= - \$5,072**

GTAC carry forward from 2022: **\$195,603**

GTAC carry forward from 2023: \$195,603 less \$5,072

**= \$190,530 carry forward 2023**

### Major costs

- **Expenditure on GTAC staffing and UHS administration support: Total \$1,229,282**
  - Teaching and non-teaching staff and special payments for POR - \$997,294
  - Expenditure on UHS accounts payable staff and HR - \$98,849
  - On costs - \$133,139
- **Cash expenditure was \$513,056 with major allocation towards:**
  - Casual employment of GTAC Scientist Mentors: \$113,193
  - Service providers (includes STEM kit delivery & animations): \$ 79,060
  - Curriculum consumables and equipment (equip new programs): \$ 78,427
  - Plant and equipment (includes microscopes, pipettes, and mini-PCR): \$ 55,890
  - Remunerations (Rural schools travel reimbursements): \$ 28,160
  - Capital budget expenditure (Assets – equip new programs): \$ 28,707
  - Non-curriculum consumables (Office supplies and cleaning products): \$ 17,676
  - Technical support (0.4 IT manager - contract JB Hi-Fi): \$ 15,239
  - Technology and equipment (interactive screens / new comp tech): \$ 11,394
  - Conferences, courses and seminars (includes EdPartnerships PL): \$ 10,156

### Reflections:

Rising salaries and costs of goods and services are resulting in GTAC operating at budget without allocation of funding into strategic reserves. In the past GTAC could operate efficiently to maintain delivery of services with a surplus of at least 10% annually to allocate towards strategic reserves.

Strategic reserves are required for the Centre to meet our long-term fiscal objectives:

- Staged upgrade of Centre facilities, equipment and technologies.
- Attract and retain quality staff.
- Invigorate our currency in the Primary Schools sector.
- Improving initiatives to support disadvantaged schools.

The current DE allocation of 60% credit to cover staffing has not been sufficient to cover our staffing requirements for more than 10 years. GTAC staffing requires an allocation of approximately 80% of our total funding allocation. This does not include funding of GTAC Scientist Mentors and 0.4 IT manager.

GTAC consistently supplements our income through winning grants or finding funding partners to provide for adequate staffing and allocation of funding towards resourcing new programs.

## PLANNING

### Report on our 2023 AIP:

Our 2023 Annual Implementation Plan (AIP) captured in **appendix 3** outlines our areas of focus and the outcomes we achieved. Major achievements include:

- Collaborated in our PLC with EdPartnerships International to develop our shared commitments to learner agency at GTAC (**Appendix 5**)
- Developed and implemented a “Big Picture” design document to guide design of programs for student agency.
- Developed tools to measure student agency in our programs.
- Developed two Teaching and Learning cycles with audit tools to guide program design. One for STEM inquiry and one for design thinking in STEM.
- Engaged with student and teacher focus groups in schools to collect student voice data to guide the design of programs.
- Designed and delivered 4 new programs for students in years 5 - 10 to activate student agency through design thinking and/or a cycle of inquiry.
- Identified and trialled a range of new technologies to activate student agency in STEM in our onsite and our outreach programs.
- Instigated a Community of Practice (CoP) for our GTAC scientist mentors to train them in teaching skills for questioning for student dialogue.
- Through a PLC cycle of inquiry, we developed a GTAC Scientist Mentor Playbook that showcases the “Talk Moves” toolkit used to support questioning for dialogue, and measured impact following mentor training.

### Annual Implementation Plan 2024:

Our school improvement team reflected on our 2023 AIP outcomes, our student and teacher data, mentor training data, and our strategic plan to identify priority areas for our 2024 AIP as outlined in the following pages.

Of importance in 2024 is to continue with our current growth in building staff capabilities to design and deliver highly engaging STEM programs, and to build consistency in high-quality teaching practice for education officers and GTAC scientist mentors.

In 2024 we will also focus on strengthening staff capabilities to effectively use data for continuous improvement.



## Annual Implementation Plan 2024 KIS 1a:

### Key Improvement Strategy 1a. Build staff capabilities to design and deliver highly engaging STEM programs (Note this is KIS5a. in UHS SPOT)

Actions	Activity	Outcomes
<p><b>Action 1:</b> Develop and implement at least 2 primary programs to activate student agency in STEM (term 1 – 4).</p> <p><b>Action 2:</b> Develop and implement a shared and responsive teaching and learning cycle that activates student agency in STEM through gamification (term 2).</p> <p><b>Action 3:</b> Build staff capabilities to design and deliver programs that actively engage and support inclusion of ATSI students in STEM (term 1 – 4).</p>	<p><b>KIS1a Activity 1:</b> Through our PLC co-develop GTAC program design guide (term 1 – 2).</p> <p><b>KIS1a Activity 2:</b> PLTs engage with primary schools and STEM education providers to observe teacher practice and student learning, to interact with student focus groups (to collect student voice data), and identify opportunities to activate student agency, and foster student curiosity and confidence in STEM learning.</p> <p><b>KIS1a Activity 3:</b> Leadership coordinates PL to engage education officers in professional cultural training and to co-create a GTAC program incorporating Indigenous ways of learning, cultural perspectives, and STEM knowledge.</p>	<ol style="list-style-type: none"> <li>1. Students display an awareness of and competence in STEM practices in inquiry or design thinking (years 5 - 10)</li> <li>2. School teachers empowered to deliver STEM programs that activate student agency and foster curiosity in STEM.</li> <li>3. Education officers apply a gamification teaching and learning cycle in program development to activate student agency, curiosity and confidence in STEM.</li> <li>4. Education officers co-design a program for inclusion of ATSI students in STEM to activate student agency and curiosity in STEM inquiry and/or design thinking.</li> <li>5. Leaders prioritise time for collaboration for program design in PLC/PLTs and allocate resources to support new primary program development.</li> <li>6. Leaders coordinate professional learning to build the capacity of education officers to design programs with a focus on ATSI inclusion in STEM.</li> </ol>

## Annual Implementation Plan 2024 KIS 1b:

### Key Improvement Strategy 1b. Build consistency in high-quality teaching practice (Note this is KIS5b. in UHS SPOT)

Actions	Activity	Outcomes
<p><b>Action 1:</b> Through our PLC, develop a mentor playbook to train mentors in strategies to provide feedback to students (term 2).</p> <p><b>Action 2:</b> Build GTAC education officers' capacity to train GTAC Scientist mentors in the HITS of questioning to foster student dialogue, and feedback (formative assessment) (Term 3 &amp; 4).</p> <p><b>Action 3:</b> Develop and implement a schedule to support education officers to train scientist mentors in questioning and feedback in a community of practice (Term 3 &amp; 4).</p>	<p><b>KIS 1b Activity 1:</b> Leadership works with Monash Q (<i>Embedding research use in educational practice</i>) to lead education officers in a cycle of inquiry to co-develop strategies for formative assessment to update the GTAC Mentor Playbook.</p> <p><b>KIS 1b Activity 2:</b> PLC leaders engage education officers in effective strategies for observing to learn to collect data on teaching and learning.</p> <p><b>KIS 1b Activity 3:</b> Leadership team provides education officers with training on having coaching conversations to improve the teaching skills of GTAC scientist mentors.</p> <p><b>KIS 1b: Activity 4:</b> Leadership establishes a calendar outlining the training sequence, pedagogies, and data collection responsibilities to achieve our CoP goals each term</p>	<ol style="list-style-type: none"> <li>1. Formative assessment is used to support individual student learning.</li> <li>2. Students engage in dialogue for STEM inquiry and/or design.</li> <li>3. Leaders and Education officers use research evidence to develop feedback strategies and apply observing to learn to collect evidence of teaching and learning.</li> <li>4. GTAC scientist mentors are supported through coaching to improve skills in questioning and feedback.</li> <li>5. Education officers coach GTAC scientist mentors in a Community of Practice.</li> </ol>

## Annual Implementation Plan 2024 KIS 1c:

### **KIS 1c. Strengthen staff capabilities to effectively use data for continuous improvement. (Note this is KIS 5c. in UHS SPOT)**

Actions	Activity	Outcomes
<p><b>Action 1:</b> Develop and embed a Centre-wide approach of using evidence to learn (term 2 – 4).</p> <p><b>Action 2:</b> Investigate approaches to using data more effectively to evaluate student and teacher experience (term 3 &amp; 4).</p> <p><b>Action 3:</b> Build teacher capacity to implement PLC inquiry cycles using the improvement cycle (term 2 – 4).</p>	<p><b>KIS1c Activity 1:</b> Engage with STEM Centres and Department of Education Tech schools’ division to identify STEM Centre key indicators of success and methods to measure program impact.</p> <p><b>KIS1c Activity 2:</b> In our PLC develop questions for qualitative and quantitative assessment of student and teacher experience (case studies and exit surveys).</p> <p><b>KIS 1c Activity 3:</b> GTAC staff work with Monash Q to develop skills in using research evidence to inform practice.</p> <p><b>KIS 1c Activity 4:</b> GTAC staff apply methods of observing to learn to collect data for use in PLC cycle of inquiry.</p> <p><b>KIS1c Activity 5:</b> Identify opportunities for working with experts to improve staff data literacy.</p>	<ol style="list-style-type: none"> <li>1. In our PLC/PLTs we embed the practice of using evidence to design, deliver and evaluate our teaching and learning programs.</li> <li>2. In our PLC we use data to review and improve teaching and learning in a cycle of inquiry</li> </ol>

## APPENDIX 1: GTAC 2023 SATISFACTION DATA

### Teacher satisfaction data:

Teachers provided feedback on their own experience of the program and that of their students. An exit survey was completed by 125 teachers: 64 VCE (51%); 50 levels 7 – 10 (40%); 11 levels 5 & 6 (9%)

**100% of teachers would recommend the program to other teachers**

	Year level teachers commenting on	Weighted mean ( /5)	Weighted % of teachers who rated the statement as High to Very high
Your interest in what you learned	VCE	4.8	100
	Levels 7-10:	4.6	98
	Primary	4.8	100
Your enjoyment of the program	VCE	4.7	98
	Levels 7-10:	4.8	100
	Primary	4.9	100
Your students' enjoyment of the program	VCE	4.7	98
	Levels 7-10:	4.6	95
	Primary	4.9	100
The way the program was presented	VCE	4.8	98
	Levels 7-10:	4.7	100
	Primary	4.9	100
Your students' engagement with the GTAC scientist mentors	VCE	4.5	86
	Levels 7-10:	4.7	100
	Primary	Not assessed	Not assessed
	VCE	4.8	98

Your overall satisfaction with the program	Levels 7-10:	4.8	100
	Primary	4.9	100
<i>This program provided opportunities for students to:</i>	Percentage of teachers who agree to strongly agree		
Actively participate to apply skills in STEM	VCE	4.7	94
	Levels 7-10:	4.9	100
	Primary	4.9	100
Engage in dialogue to enhance understanding	VCE	4.7	99
	Levels 7-10:	4.8	100
	Primary	4.8	100
Apply research grade technologies	VCE	4.8	100
	Levels 7-10:	4.9	100
	Primary	4.8	100
<i>This program provided me with insights into:</i>	Percentage of teachers who agree to strongly agree		
Pedagogies that can be used in my classroom	VCE	4.3	81
	Levels 7-10:	4.6	99
	Primary	4.6	91
How technologies are applied in Life Science investigations	VCE	4.7	95
	Levels 7-10:	4.6	95
	Primary	4.6	91
How my students learn	VCE	4.1	75
	Levels 7-10:	4.2	81

	Primary	4.6	82
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## Student satisfaction data:

A student satisfaction survey was completed by 1273 students – 913 VCE (71%); 264 levels 7 – 10 (21%); and 96 levels 5 & 6 (8%)

	Year level of students	Weighted mean ( /5)	Weighted % of students who rated as High to Very High
Your interest in what you learned	VCE	4.3	87
	Levels 7-10:	4.1	78
	Primary	4.5	90
Your enjoyment of the program	VCE	4.3	85
	Levels 7-10:	4.3	83
	Primary	4.6	94
Presentation of the program	VCE	4.3	88
	Levels 7-10:	4.2	83
	Primary	Not assessed	Not assessed
Your satisfaction with the program	VCE	4.4	90
	Levels 7-10:	4.3	87
	Primary	4.4	90
Scientist mentors helped me to use and understand the technology so I could analyse results	VCE	4.5	93
	Levels 7-10:	4.6	100
	Primary	Not assessed	Not assessed

## APPENDIX 2: REPORTING ON OUR 2023 AIP

**Key Improvement Strategy 1a.** *Build staff capabilities to design and deliver highly engaging STEM programs:*  
The focus for this Key Improvement Strategy (KIS) in 2023 were our GTAC Education Officers who design, develop, deliver and evaluate GTAC programs.

Actions	Activities	Outcomes / indicators of success
Develop shared staff commitments to student agency in program design and delivery in the GTAC context	<p><b>Activity 1:</b> Leaders work with EdPartnerships international to build staff capacity to design programs with a student agency lens: develop shared understandings, processes, and expectations (AP/Teachers - \$20k)</p>	<p>Program design and evaluation tools:</p> <ol style="list-style-type: none"> <li>7. GTAC commitments to student agency artefact.</li> <li>8. Student agency measurement tools.</li> </ol>
PLC/PLTs engage with school and community networks to identify opportunities to activate student agency in learning	<p><b>Activity 3:</b> Professional Learning Community (PLC) and Professional Learning Teams (PLTs) engage with primary schools and STEM education providers to observe teacher practice and student learning, to interact with student focus groups, and identify opportunities to activate student agency in learning (AP/PLC leaders/Teachers - \$2k)</p> <p><b>Activity 5:</b> Collaborate in PLTs to trial and evaluate new teaching and learning practices, and new STEM technologies and equipment, that activate student agency in STEM inquiry and design thinking (AP/teachers - \$20k)</p> <p><b>Activity 6:</b> Collaborate in PLTs to establish &amp; pilot two new approaches to using STEM technologies and equipment to engage and motivate students in GTAC outreach programs (AP &amp; Teachers - \$30k)</p>	<p>New programs designed using student voice data:</p> <ul style="list-style-type: none"> <li>- <i>One Health Heroes:</i> a multi-day program for year 5 &amp; 6 students (online, incursion, STEM kit, and virtual components) with a focus on inquiry and design thinking.</li> <li>- <i>Tackling the pollination problem:</i> multi day program for year 5 &amp; 6 students (online, incursion, onsite and virtual components) with a focus on design thinking.</li> <li>- <i>Micro and nano World explorers:</i> program for secondary students (online and STEM kit components) with a focus on inquiry.</li> <li>- Case studies and agency measurement tools used to reflect and identify areas for improvement for 2024.</li> </ul>
To support program design for STEM inquiry and/or Design thinking: Collaborate in our PLC to develop and implement shared and responsive	<p><b>Activity 2:</b> Leadership works with PLC team to implement shared processes and protocols for PLTs to design, review, develop, deliver, and evaluate new student programs with a focus on student agency, curiosity and confidence in STEM (AP/PLC leaders/Teachers - \$10k)</p>	<p>T&amp;L cycles with associated audit tolls are used to guide the design of new programs.</p> <p>Students participating in new programs display an awareness of and competence in STEM practices in inquiry or design thinking (years 5 – 10).</p> <p>New online resources being accessed by students and teachers provide</p>

<p>teaching and learning (T&amp;L) cycles with audit tools. Each T&amp;L cycle emphasises student agency and curiosity and confidence in STEM.</p>	<p><b>Activity 4:</b> Through our PLC develop and apply models for STEM inquiry and for Design Thinking for use in program design and delivery (student programs years 5 – 10) including development of a toolbox of evidence-based strategies to apply in teaching and learning at each step (AP/PLC leaders/Teachers - \$1k)</p>	<p>thinking tools and graphic organisers that support student agency through a cycle of inquiry or through design thinking.</p> <ul style="list-style-type: none"> <li>- Design Thinking: <a href="https://gtac.edu.au/design-thinking/">https://gtac.edu.au/design-thinking/</a></li> <li>- Cycle of Inquiry: <a href="https://gtac.edu.au/scientific-inquiry-cycle/">https://gtac.edu.au/scientific-inquiry-cycle/</a></li> </ul>
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**Key Improvement Strategy 1b. Build consistency in high-quality teaching practice:**

A major focus for this KIS in 2023 was our GTAC Scientist Mentors. GTAC employs up to 80 PhD research students on a casual basis to inspire students in STEM. Our scientist mentors guide small groups of 6 students in their STEM inquiry and design thinking as a major component of our programs. These staff are not teacher trained. GTAC Education Officers are also a focus as they have a role in training scientist mentors through designing, delivering, and evaluating training programs; and through the design of student programs.

Actions	Activities	Outcomes / success indicators
<p>Develop Education Officer and Scientist Mentor instructional practice in the HITs of questioning through collaborative inquiry-based PLC and Community of Practice (CoP)</p>	<p><b>Activity 1:</b> Leaders establish a CoP with paid time for GTAC scientist mentors to be trained/coached in questioning for collaborative dialogue. (AP/PLC leaders/Teachers - \$15K)</p>	<p>9. Developed a GTAC Scientist Mentor playbook for questioning for dialogue.            10. Community of Practice training schedule implemented as part of mentor paid shifts – trained in <i>Talk Moves</i> strategies for questioning as per playbook.            11. CoP events held for all available GTAC Scientist Mentors at start of year to launch our CoP and end of year to review practice.</p>
<p>The leadership team leads Education Officers in a cycle of improvement and develops their capacity to use education research well in practice</p>	<p><b>Activity 2:</b> Leadership team implements a PLC cycle of inquiry to develop, implement and evaluate the GTAC scientist mentor Playbook on questioning for collaborative dialogue. (AP/PLC leaders/Teachers - \$10K)</p>	<p>Developed a <i>Mentor playbook for questioning and dialogue</i>, based upon <i>Talk Moves</i> model for rich and meaningful discussions.            Measurement tools applied reveal an increase in collaborative student dialogue with one another and their GTAC scientist mentors.            Scientist mentors’ end of year reflections show that they now understand and explicitly use questioning strategies to engage students in collaborative dialogue.</p>



### APPENDIX 3: CHART OF ACCOUNTS

<b>Centre</b>	GTAC – Gene Technology Access Centre	<b>Rates</b>	
		Index model Specialist Schools Long Term Leave Premium (per student)	\$149.42
<b>School</b>	The University High School	All other Schools Long Term Leave Premium %	1.297%
<b>Year Ended</b>	2023	On-cost Rate	13.35%

**Credit (SRP)** Obtain this information from the School SRP reports

**Revenue from SRP** Insert new rows as needed

SRP Credit Revenue	\$ 948,264.00
Cash to Credit Transfers	\$ 289,364.98

**Expenditure SRP Credit** Insert new rows as needed

Teaching Staff	\$ 757,737.00
Non-Teaching Staff	\$ 231,557.00
Special Payments	\$ 8,000.00
UHS A/C Payable & HR	\$ 98,849.48
On Costs	\$ 133,138.75
Credit to Cash Transfers	\$ -

Teaching class  
Education Support class  
Positions of Responsibility  
UHS administration support

**SRP Surplus/Deficit** \$ 8,346.75

**Cash (CASES21)** Obtain information from the School CASES21 reports

**Brought Forward Bank Balances** \$ 195,602.51

**Revenue (Cash)** Insert new rows as needed

Cash Grant (SRP Cash Revenue)	\$ 632,176.00
DE repairs and maintenance	\$ 28,163.30
Cash SRP Funding	\$ 3,500.00
Reimbursements	\$ 93,869.55
Hire of School Facilities/Equipment	\$ 39,650.91
<b>Total Cash Revenue</b>	<b>\$ 797,359.46</b>

From DE  
CRT cover – teaching excellence program  
VCES grant salary reimburse  
Teacher PL & SR student program fees

**Expenditure (Cash)** Insert new rows as needed

Non-Teaching Staff	\$ 115,413.36
CRT Staff	\$ 5,350.00
Superannuation	\$ 12,820.62

GTAC Scientist Mentors  
GTAC Scientist Mentors

Workcover	\$ 2,928.55
Non-Curriculum Consumables	\$ 17,676.11
Photocopying	\$ 1,360.50
Curriculum Consumables	\$ 78,427.46
Computer Applications <\$5,000	\$ 5,402.14
Postage	\$ 656.64
Telephone	\$ 3,467.29
Internet/Comm Costs <\$5,000	\$ 770.35
Furniture Fittings <\$5,000	\$ 986.88
Repairs/Maintenance Equipment	\$ 3,319.44
Technology Equipment <\$5,000	\$ 11,393.76
Plant & Equipment <\$5,000	\$ 55,889.79
Security/Safety/Fire prevention	\$ 3,914.39
Building Works	\$ 13,208.15
Domestic Travel Expenses	\$ 2,801.22
Motor Vehicles – Lease/Rental	\$ 4,808.55
Advertising/Marketing	\$ 2,079.95
Insurance	\$ 1,751.00
Affiliations	\$ 270.00
Conferences/Courses/Seminars	\$ 10,155.63
Light Refreshments	\$ 5,614.88
Donations, Gifts & Awards	\$ 200.00
Technical Support	\$ 15,238.80
Service Provider	\$ 79,059.65
Remuneration	\$ 28,159.83
Camps/Excursions/Activities	\$ 1,227.27
Fees & Charges	\$ 7.98
Capital Budget Expenditure	\$ 28,706.50
Cash to Credit	\$ 289,364.98
<b>Total Cash Expenditure</b>	<b>\$ 802,431.67</b>
<b>Net Cash Surplus/(Deficit)</b>	<b>\$ 190,530.60</b>
<b>Carry Forward Bank Balances</b>	<b>\$ 190,530.60</b>

GTAC Scientist Mentors

## APPENDIX 4: CASE STUDY - NEW STEM KITS PROGRAM

Our new STEM kit program [Micro and Nano World Explorers](#) launched in 2023. GTAC staff designed a STEM kit to be used by teachers and students in their schools to activate student agency as they apply the [GTAC interactive cycle of inquiry](#) to investigate a living or non-living item of their own choosing using microscopy. The cycle of inquiry provides teachers and students with thinking tools and graphic organisers to support each step of the inquiry process. This supports students to explore self-directed lines of inquiry, driven by their own curiosity.

A new partnership with [Inspire STEM Education](#) was forged with GTAC paying for delivery of the STEM kit and an \$80,000 desktop Scanning Electron Microscope (SEM) into secondary schools across Victoria. The STEM kit also includes imaging compound microscopes with screens, dissecting microscopes, prepared samples for demonstration, and the materials required to prepare specimens for each microscope.

The program was delivered to **5,344 Students** across **15 schools** in Victoria at a cost to GTAC of \$22,000.00.

### Examples of student investigations carried out in the classroom in 2023:

- Year 7 students exploring animal morphology.
- Year 10 Science students creating a pollen library of their local area.
- VET Hairdressing students investigating the effect of different hair treatments on split ends.
- VCE Biology investigated local bird species and used a pollen library to determine feeding habits.
- VCE Physics looking at circuit components of various devices.

*“As soon as I got to see the scale of it, it just made me want to do this more, I want to get all this stuff and it got to the point where I asked teachers if I could use it later just to get through all the stuff I wanted to look at” - Year 10, Upper Yarra Secondary College Student*

### Teacher Professional Learning:

To participate in the program at least one teacher or laboratory technician was required to complete training on the use of the SEM and microscopes to implement the cycle of inquiry in their classrooms. They were provided a choice between participating in an onsite or synchronous videoconferencing professional learning (PL) program. A total of 31 teachers and laboratory technicians attend the PL: 19 from 12 Schools attended onsite PL, and a further 16 from 7 schools attended the synchronous videoconferencing PL. Online training modules were provided for teachers to refer back to and to support these teachers to fulfil the role of training other teachers to deliver the program in their classrooms.



100% of teachers would recommend this STEM kit program to their colleagues. The summary data from 17 teachers across 14 schools is shown below:

- 100% rated their students' enjoyment of the program as high to very high
- 100% rated their students' interest in the program as high to very high
- 100% agreed to strongly agreed that the program fostered student curiosity
- 100% agreed to strongly agreed that the program provided insights into pedagogies that can be used to activate student agency in their classroom
- 100% agreed to strongly agreed that the program supported them to use a cycle of inquiry to foster student curiosity and confidence in research
- 88% agreed to strongly agreed that the program activated student agency

Upon further investigation we found that some teachers were unsure as to whether students could use the SEM, so they ran this component of the program themselves from the front of the classroom, reducing student agency. In response to feedback the following improvements are being implemented in 2024:

1. Increase the focus on student agency through the STEM Cycle of inquiry during the teacher professional learning events to help teachers recognise the merits of students following their own line of inquiry. Develop a landing page for the program on our website so teachers and students can easily access materials to support their inquiry and be inspired by the work of other schools.
2. Include a short course for students on how the SEM functions.
3. Develop an online map to showcase the investigations of students from schools.

## APPENDIX 5: GTAC COMMITMENTS TO STUDENT AGENCY

<b>At GTAC we understand that agentic learners .....</b>
<ul style="list-style-type: none"><li>● Make choices based on what is important to them and their communities.</li><li>● Ask questions and voice their thinking.</li><li>● Explore ideas and take risks.</li><li>● Act purposefully and confidently within their local and global communities.</li></ul>
<b>At GTAC we create the conditions for agency by .....</b>
<ul style="list-style-type: none"><li>● Fostering curiosity.</li><li>● Valuing and listening to learners, taking time to understand them.</li><li>● Enabling opportunities for collective self-direction.</li><li>● Nurturing safe and trusting relationships that foster collaborative learning.</li><li>● Designing within the context of 'real world experiences' to draw learners into continued and deeper learning.</li></ul>
<b>We strengthen the conditions for agency when we .....</b>
<ul style="list-style-type: none"><li>● Partner with students and teachers to co-design and strengthen our programs to reflect their local and global interests.</li><li>● Create opportunities for inquiry and/or design thinking.</li><li>● Strengthen learner's capabilities and confidence to generate questions, explore diverse ideas, and offer their perspective.</li><li>● Nurture learner decision making and collective action through flexible learning experiences.</li><li>● Invite learning conversations that support the growth and progress of all learners - individually and collectively.</li></ul>