

# Assessment approaches used

Assessment that enables learners to see and appreciate the progress that they have made and promote further learning and development .

- Students also used the Solution Fluency to help them plan the process and to ensure they stayed on track. This was done using Google doc.
- We also attempted to use the Melbourne University CPS online tool. While this looked really good and we tested it with staff, the program was not able to cope with an entire class on at one time and the students got totally frustrated with it. We didn't continue with its use.



**Define** To define a problem is to identify it and plan *where we are going* with it before we start. Define skills include restating the problem, challenging assumptions, gathering facts and chunking the details.

**Discover** Discover, is an exploration phase, asking lots of questions. *How did we get here?* What could have been done differently? Does that still apply? Discover skills include taking smart notes, skimming, scanning, analysing and authenticating.

**Dream** Dream, is a whole mind process that allows us to imagine the solution. A visioning process where we *decide where we want to go*. Dream skills include generating wishes and exploring possibilities.

**Design** Design, is the process of gap analysis using all the necessary steps *to get us from here to there*. We create a plan to guide us as we work. Design skills include starting with the end in mind and building backwards creating instructions in small increments that are positive and logical.

**Deliver** Putting the plan into action and making the dream a reality. *Producing and publishing*. Deliver skills include identifying the most appropriate presentation format and presenting the solution.

**Debrief** Looking at the final product to determine *what was done well and what could be improved* using self and peer assessment. Skills include reflecting critically on the process and the product and acting on the reflections.

<b>PROBLEM SOLVING USING THE SOLUTION FLUENCY</b>	
<b>MY IDEA/PROJECT</b> (Unit of work, Topic for the day, Assignment, My Big Question)	
<b>SOLUTION FLUENCY</b>	<b>DETAILS</b>
<b>DEFINE</b> Restating the problem.	
<b>DISCOVER</b> Exploration. Asking lots of questions. (QFT)	
<b>DREAM</b> Imagine the perfect solution.	
<b>DESIGN</b> A plan to guide our work. Start with the end in mind. The steps to get us from 'here' to 'there'.	
<b>DELIVER</b> Putting the plan into action and making the dream a reality. Producing and Publishing.	
<b>DEBRIEF</b> Reflecting critically on the process and the product. What was done well and what could be improved.	

# Assessment approaches used

Assessment of student achievement  
against goals and standards

- Assessment Rubric – Teacher assessed and each group self assessed against the rubric.
- Individual and Group Reflections task.
- Teacher assessed each student using the Collaboration NPDL New Measure.
- Students self assessed using the NPDL Collaboration New measure – Student version.

Year 7 Collaborative Task Reflection.

Name : \_\_\_\_\_ Form: \_\_\_\_\_

Name 3 things you think we should be able to see when a team of students are collaborating on a task.

i) \_\_\_\_\_

ii) \_\_\_\_\_

iii) \_\_\_\_\_

Before checking in with each of your team members; how successfully do you think your team collaborated to ensure that each member was able to contribute to the solution for this problem?

\_\_\_\_\_

\_\_\_\_\_

Name two things you could have done better personally to improve the outcome for the other members of your team.

\_\_\_\_\_

\_\_\_\_\_

Name two things that other members of your team could have done to help you have a better outcome.

\_\_\_\_\_

\_\_\_\_\_

Discuss with the other members of your team what you think you did really well together. Tell me about something you discussed and why it went so well.

\_\_\_\_\_

\_\_\_\_\_

Discuss with the other members of your team what you think didn't go so well. Tell me about something you discussed and see if you can give a reason why that didn't go so well.

\_\_\_\_\_

\_\_\_\_\_

**Year 7 Rube Goldberg Challenge**  
Assessment Rubric

Criteria	1 - Limited	2 - Emerging	3 - Developing	4 - Accelerating	5 - Proficient
Construction of the machine, meeting the criteria.	A complete machine was not built.	A machine was built but was not within the designated space or did not have four distinct stages.	A machine was built within the confines of the designated space and had more than two distinct stages.	The machine was built within the confines of the designated space and has at least four distinct stages.	The machine exceeded all requirements showing innovation, ingenuity and creativity of design.
The accuracy of the machine as a measurement of time.	The machine failed to run from start to finish.	The machine ran from start to finish occasionally but did not measure 20 seconds on any occasion.	The machine ran from start to finish most times but did not measure 20 seconds on any occasion.	The machine ran from start to finish and measured 20 seconds on some occasions.	The machine ran from start to finish and accurately measured 20 seconds on three consecutive occasions.
Collaboration	The team members worked independently and did not make decisions together. Interpersonal and team related skills were not present. Individuals tend to see things only from their own perspective.	The team has identified some individual tasks that need to be completed. Decisions are not made collectively. Individuals are beginning to understand how their behavior affects others.	The team decides together how to match tasks with individual strengths and make joint decisions about important issues, processes and solutions. They demonstrate shared responsibility and listen well to others points of view.	The team clearly understands how they should work together and this is evident as they work. They understand the need for joint responsibility. They have a strong sense of self and others viewpoints and work effectively to support the team.	The team demonstrated a highly effective interdependent approach to the construction of their machine with all members taking active responsibility, individually and collectively for the final product, being considerate of each member in the group and the skills they possess.
Able to demonstrate an understanding of the forces involved.	The student showed little knowledge of the forces involved in the different stages of their machine.	The student could describe some of the forces involved in their machine.	The student showed a clear understanding that there were different forces involved in each part of their machine but was unable to identify all of them.	The student could explain the forces involved in each stage of the machine.	The student could clearly articulate all forces demonstrated in each stage of their machine and how they interacted to enable the machine to carry out its task.

Leveraging Digital	Collaboration
	<p>Work interdependently and synergistically in teams with strong interpersonal and team-related skills including effective management of team dynamics and challenges, making substantive decisions together, and learning from and contributing to the learning of others.</p> <p></p> <p><b>Limited Evidence</b></p> <ul style="list-style-type: none"> <li>I can focus on my work when I am working beside others and share materials.</li> <li>I can help my team complete a learning job when the teacher tells me the team what to do and how to do it.</li> <li>I need reminders to change behaviour that is disruptive, when I am working in a group.</li> <li>AND/OR I can share my own viewpoint with others but will change my view to avoid conflict.</li> <li>AND/OR I can share my own viewpoint with others but will take the view of others in response to peer pressure.</li> <li>I need help to fix conflicts that happen when I am working in a group.</li> </ul> <p><b>Emerging</b></p> <ul style="list-style-type: none"> <li>I can work in a team to complete a shared goal but the work each team member does is not equal and only 1 or 2 group members have made the decisions for the team.</li> <li>I can use cooperative group strategies that my teacher chooses.</li> <li>I can monitor my behaviour to ensure it is not disruptive to others on my team.</li> <li>I can offer ideas to the group, with reminders.</li> <li>I can offer my opinion to the group, with reminders.</li> <li>I can share what I know and understand with the group, with reminders.</li> <li>I can listen to others share their knowledge, opinions and ideas without interrupting, with reminders.</li> <li>I can identify similarities and difference between my viewpoint and the viewpoint of others, and give reasons for these, with guidance.</li> <li>I can ask questions when I don't understand, with reminders.</li> <li>I can paraphrase what others have said to make sure I understand, with reminders.</li> <li>I can agree to compromises that others come up with.</li> </ul> <p><b>Developing</b></p> <ul style="list-style-type: none"> <li>I can work with a team to make decisions about our learning purpose, our learning tasks, and how we will navigate our learning.</li> <li>I can work with my team to identify the strengths of each team member.</li> <li>I can work with my team to match learning jobs with the specific strengths of my team members.</li> <li>I can work with one or two of my team members or with the whole team to complete a shared goal.</li> <li>I can suggest one or more cooperative group strategies for our group to use to help it operate well.</li> <li>I can do my fair share when I am working in a team.</li> <li>I can offer ideas to the group and share where my ideas have come from.</li> <li>I can offer my opinion to the group.</li> <li>I can share what I know and understand with the group.</li> <li>I can invite others into discussions.</li> <li>I can listen to others share their knowledge, opinions and ideas without interrupting.</li> <li>I can explain why the opinions, feelings, and ideas of group members might differ and can</li> </ul>
	<p>Identify the value of varying perspectives.</p> <ul style="list-style-type: none"> <li>I can ask questions when I don't understand.</li> <li>I can paraphrase what others have said to make sure I understand them.</li> <li>I can work with my team to solve most problems and meet most challenges, although we do require adult intervention on occasion.</li> <li>I can suggest compromises when my team disagrees.</li> </ul> <p><b>Accelerating</b></p> <ul style="list-style-type: none"> <li>I can work with a team to make decisions about our learning purpose, our learning tasks, and how we will navigate our learning, and together we can justify our decisions.</li> <li>I can work with my team to identify the strengths of each team member, and can provide evidence of our evaluations.</li> <li>I can work with my team to match learning jobs with the specific strengths of our team members, and can explain how these decisions will enable our team to work more effectively and productively.</li> <li>I can work with my team to meet a mutually determined challenge, and explain how the contributions of everyone enabled us to be successful in a way that would not have been possible had we been working alone.</li> <li>I can offer ideas to the group and share where my ideas have come from and why I believe they should be considered.</li> <li>I can offer my opinion to the group and justify my thinking.</li> <li>I can share what I know and understand with the group and explain how this knowledge might help us meet our group goals.</li> <li>I can invite and encourage other team members to share their ideas, opinions, feelings and knowledge with the group.</li> <li>I can listen to the contributions of others and use their knowledge, skills, opinions and ideas to grow my thinking, my skills and my understanding.</li> </ul> <p><b>Proficient</b></p> <ul style="list-style-type: none"> <li>I can plan out the workload with my team to ensure that everyone does his fair share and completes tasks that are matched to individual strengths.</li> <li>I can set time lines for task completion and regular meeting times so that everyone in the team know what everyone else is doing as we work to meet our goal.</li> <li>I can share my ideas, opinions with my group and justify my thinking.</li> <li>I can share what I know and understand with the group and explain how this knowledge might help us meet our group goals.</li> <li>I can invite and encourage other team members to share their ideas, opinions, feelings and knowledge with the group.</li> <li>I can listen to the contributions of others and use their knowledge, skills, opinions and ideas to challenge and/or develop my thinking, my skills and my understanding.</li> <li>I can change my opinions, feelings and ideas based on the contributions of others, and can explain my change of thinking.</li> <li>I can respectfully question the viewpoints of others when I disagree.</li> <li>I can ask others questions to help further their thinking.</li> <li>I can use my strengths to coach others when I have strengths they do not have.</li> <li>I can accept coaching from my teammates when they have strengths I do not have.</li> <li>I can use a problem solving process and decision making process with my team to help us do our best thinking and learning.</li> <li>I can evaluate the effectiveness of our team and offer ideas for improvement.</li> <li>I can demonstrate the above skills when working with individuals in my own class, school, schools regionally, nationally and internationally.</li> </ul>

# Assessment approaches used

Assessment of student achievement  
against goals and standards

- On competition day every student was able to vote for the most creative and innovative Rube Goldberg machine.
- Each form also had a winner that was able to time most consistently and accurately the 20 sec requirement. There was then a final with an overall winner.

I think the most creative and innovative Rube Goldberg machine is:

Form	Group
<input type="text"/>	<input type="text"/>



# The Impact (academic – against the standards)

Student name	M / F	Pre-asses s	Academic score for this task <i>AusVELS</i>	Evidence
Stud A	M	Top	7.0	<p><b>This student showed the following:</b></p> <ul style="list-style-type: none"> <li>• Able to make accurate predictions based on scientific knowledge.</li> <li>• Developed Science knowledge through collaboration.</li> <li>• Described clearly all the forces involved in their machine.</li> <li>• Planned and conducted a range of investigations and experiments.</li> <li>• Communicated many ideas and found solutions to problems.</li> <li>• Successfully used appropriate digital technologies.</li> <li>• Able to accurately evaluate the quality of their data and reflect and modify as required.</li> </ul>
Stud B	F	Top	7.0	<p><b>This student showed the following:</b></p> <ul style="list-style-type: none"> <li>• Able to make accurate predictions based on scientific knowledge.</li> <li>• Developed Science knowledge through collaboration.</li> <li>• Described clearly all the forces involved in their machine.</li> <li>• Planned and conducted a range of investigations and experiments.</li> <li>• Communicated many ideas and found solutions to problems.</li> <li>• Successfully used appropriate digital technologies.</li> <li>• Able to accurately evaluate the quality of their data and reflect and modify as required.</li> </ul>



Axel and Team Planning

Document



Axel – Collaborative task reflection

Document



Axel and Team Assess Rubric

Document



Carly and Team Planning

Document



Carly – Collaborative task reflection

Document



Carly and Team Assess Rubric

Document



# The Impact (academic – against the standards)

Student name	M/ F	Pre- asses	Academic score for this task <i>AusVELS</i>	Evidence
Stud C	M	Mid	6.5	<p><b>This student showed the following:</b></p> <ul style="list-style-type: none"> <li>• Able to make some predictions based on scientific knowledge.</li> <li>• Developed Science knowledge through collaboration.</li> <li>• Described most of the forces involved in their machine.</li> <li>• Planned and conducted some investigations and experiments.</li> <li>• Communicated some ideas and worked on solutions to problems.</li> <li>• Successfully used appropriate digital technologies.</li> <li>• Able to evaluate their data and reflect and modify some of their components.</li> </ul>
Stud D	F	Mid	6.5	<p><b>This student showed the following:</b></p> <ul style="list-style-type: none"> <li>• Able to make some predictions based on scientific knowledge.</li> <li>• Developed Science knowledge through collaboration.</li> <li>• Described most of the forces involved in their machine.</li> <li>• Planned and conducted some investigations and experiments.</li> <li>• Communicated some ideas and worked on solutions to problems.</li> <li>• Successfully used appropriate digital technologies.</li> <li>• Able to evaluate their data and reflect and modify some of their components.</li> </ul>



Document

Isaack and Team Planning



Document

Isaack – Collaborative task reflection



Document

Isaack and Team Assess Rubric



Document

Alicia and Team Planning



Document

Alicia – Collaborative task reflection



Document

Alicia and Team Assess Rubric



# The Impact (academic – against the standards)

Student name	M / F	Pre-asses	Academic score for this task AusVELS	Evidence
Stud E	M	Low	6.0	<p><b>This student showed the following:</b></p> <ul style="list-style-type: none"> <li>• Able to make a few predictions based on scientific knowledge.</li> <li>• Did not show any Science knowledge through collaboration.</li> <li>• Not Able to described any of the forces involved in their machine</li> <li>• Did not conduct investigations and experiments.</li> <li>• Did not communicate any ideas and struggled to work on solutions to problems.</li> <li>• Did not use basic digital technologies for research. (by choice)</li> <li>• Not able to modify any components.</li> </ul>
Stud F	F	Low	6.0	<p><b>This student showed the following:</b></p> <ul style="list-style-type: none"> <li>• Able to make limited predictions based on scientific knowledge.</li> <li>• Struggled to develop Science knowledge through collaboration.</li> <li>• Able to described one of the forces involved in their machine.</li> <li>• Conducted investigations and experiments by trial and error only.</li> <li>• Communicated at least one idea but struggled to work on solutions to problems.</li> <li>• Used basic digital technologies for research.</li> <li>• Able to modify some of their components through trial and error only.</li> </ul>



James and Team Planning

Document



James – Collaborative task reflection

Document



James and Team Assess Rubric

Document



Hailie and Team Planning

Document



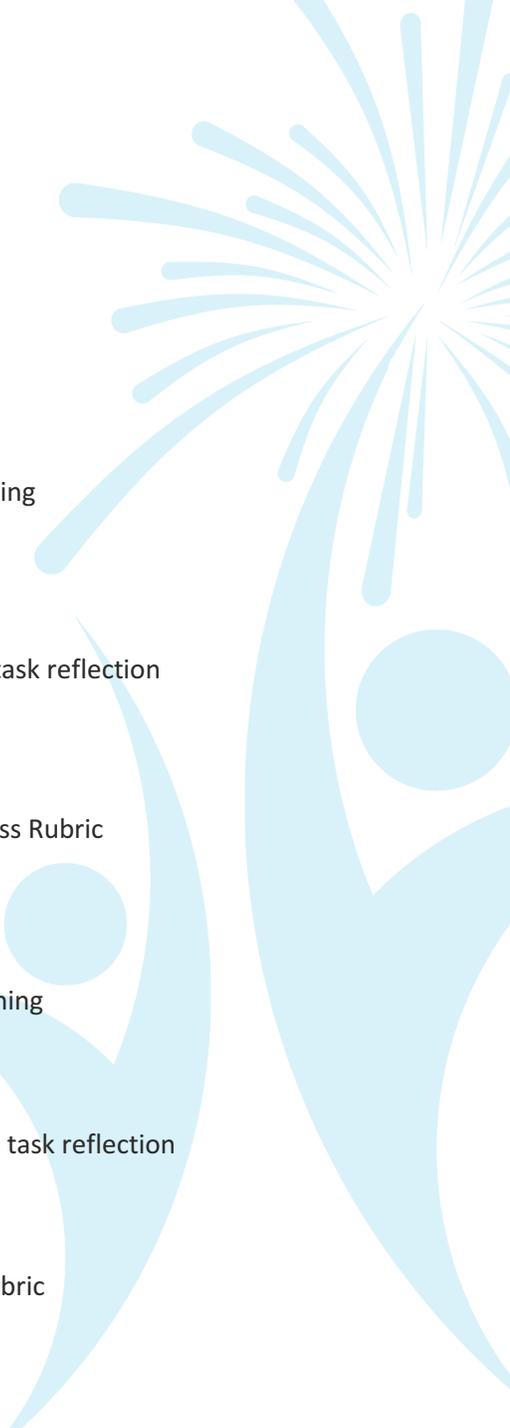
Hailie – Collaborative task reflection

Document



Hailie Assessment Rubric

Document



# The Impact (6Cs/broader life skills)

			Collaboration					1 = Limited evidence 2 = Emerging 3 = Developing 4 = Accelerating 5 = Proficient
Student name	M / F	Student pre-rating	Working interdependently as a team	Interpersonal and team-related skills	Social, Emotional and Intercultural skills	Leveraging Digital	Managing team dynamics and challenges	
Stud A	M	Top	<p>4</p> <p>Axel showed a good understanding of the fact that each team member had different strengths and was able to use this to develop ideas and solve problems. Axel's contribution to his team were supportive of the collective effort.</p>	<p>4</p> <p>Axel understood the importance of listening to all members of the team and to making responsible contributions. His example allowed his team to function to a high degree collaboratively.</p>	<p>4</p> <p>Axel is a quiet confident worker who is able to support others in their learning and ensure that the team works harmoniously.</p>	<p>4</p> <p>Axel was able to use multiple digital resources to research and collaborate, to ensure that all team members were contributing to the final product.</p>	<p>4</p> <p>Axel's quote: "If a team is collaborating well you should see some good argumentative discussions." He listens well to others and is able to manage team dynamics to ensure the project progressed.</p>	 Document Axel – Collaboration self reflection   Axel – Self Pre-assess
Stud B	F	Top	<p>4</p> <p>Carly was able to describe how each member of her team had different strengths and how this was used to make decisions that were best for the whole team. The contributions of each of her team members was obvious in their final product.</p>	<p>3</p> <p>Carly showed a good understanding of collective ownership with a strong sense of shared responsibility however was unable to facilitate this in other team members.</p>	<p>5</p> <p>Carly has highly developed social and emotional skills. She is able to foster positive relationships and shows empathy and understands others' perspectives.</p>	<p>4</p> <p>Carly showed how the use of digital tools supported her team in the decision making process and provided an avenue for facilitating interdependence.</p>	<p>4</p> <p>Carly listens well to others and contributes responsibly as require. She is able to learn from others and modify her own points of view. She can take action that supports the teams progress.</p>	 Document Carly – Collaboration self reflection   Carly – Self Pre-assess

# The Impact (6Cs/broader life skills)

			Collaboration					1 = Limited evidence 2 = Emerging 3 = Developing 4 = Accelerating 5 = Proficient
Student name	M / F	Student pre-rating	Working interdependently as a team	Interpersonal and team-related skills	Social, Emotional and Intercultural skills	Leveraging Digital	Managing team dynamics and challenges	
Stud C	M	Mid	2 Isaack was able to complete his part of the project with some assistance from others in the group. There tasks were not coordinated in anyway or decided upon by the group. Only a few decisions were made together as a group.	2 Decisions about the task were made by individuals without collective ownership though it was recognised that they all needed to be working towards the final product.	3 Isaack has a good awareness of his own perspectives and listens well to others and values the opinions and perspectives of others.	3 Isaack is able to collaborate on line and provide feedback to others. He is able to research the information he needs to support his thinking.	2 Isaack's team struggled to forge working relationships and take individual ownership of the collective task.	 Microsoft Word Document Isaack – Collaboration self reflection
Stud D	F	Mid	3 Alicia was able to work with the others in her team to match different tasks to individual strengths. All members of her team were involved equally in the decision making processes for developing solutions to their problems.	3 Alicia demonstrated good interpersonal skills and a sense of ownership of the project. She listened effectively, negotiated and agreed on goals for each part of their project.	3 Alicia was able to empathize with the emotions and view points of others and value their perspectives even when different from hers.	3 Alicia effectively used digital tools to support her teams' research and investigations and to provide feedback collaboratively online.	3 Alicia worked very effectively in her team though needed support when the team got 'stuck'. She is developing her ability to respectfully and clearly express her own viewpoints.	 Document Alicia – Collaboration self reflection   Alicia – Self Pre-assess

# The Impact (6Cs/broader life skills)

Collaboration								1 = Limited evidence 2 = Emerging 3 = Developing 4 = Accelerating 5 = Proficient
Student name	M / F	Student pre-rating	Working interdependently as a team	Interpersonal and team-related skills	Social, Emotional and Intercultural skills	Leveraging Digital	Managing team dynamics and challenges	
Stud E	M	Low by choice	1 James was not able to show that he could work with his groups. He didn't contribute anything to the final product. His lack of focus with his group led him to interrupt others. He wouldn't listen to his group members. Others tried to include him but gave up on him. This is due to his attitude to school and isn't interested in learning.	1 James didn't show any empathy for his team members or desire to achieve the goal. He wasn't interested in success or failure. He didn't complete any of the pre or post tasks or planning to a satisfactory standard.	1 He is aware of himself but likes to annoy people rather than contribute positively. Very attention seeking behaviour. Is only interested in himself and not others. Cannot form positive relationships.	1 Used his iPad inappropriately. Didn't do any planning. Didn't do Padlet or Google doc.	1 James didn't share any ideas with the team. Didn't listen to others and preferred to incite conflict rather than resolve. Although capable, he chose not to contribute positively.	 Document James – Collaboration self reflection  <div style="border: 1px solid black; padding: 2px; display: inline-block;">Didn't complete</div> James – Self Pre-assess   Document Hailie – Collaboration self reflection
Stud F	F	Low Ability & Confidence	1 Hailie didn't contribute any resources, decisions or planning to her team. This resulted in an unsuccessful attempt. She preferred to follow others than contribute.	1 Happy to help out but never contributed suggestions of her own. Very good communicating with random chatting but not on track.	1 She is aware of her own behaviours but can be disruptive possibly due to lack of understanding. Not many friends in group. No machine produced	1 Faced with the challenge of using 3D printing she gave up. Too hard. No contribution to Google doc but added one basic comment on the Padlet.	1 No consistency with ideas. She avoids conflict by deferring to others views and not sharing her own. Team weren't able to produce machine due to changing ideas.	 Hailie – Self Pre-assess

# Other Impact

---

## a. Engagement of Dyslexic student

This task gave our most dyslexic student a chance to shine. He went home and made a component of his groups machine all by himself. He videoed his entire process and showed reflection that led to the modification of his design. This student usually does very little in class. He also didn't engage further with his team as he had done his bit.

His team were very inclusive and encouraging of his participation.

## b. Staff motivation

Not all staff involved felt it was worthwhile. A teacher who was more academic (content) focused couldn't see any value for academic learning. Agreed it was fun and students may have learnt about collaboration.

Other staff found it rewarding and a valuable experience for students and staff. Not just for teaching concepts but for interest in Science as a whole.

## c. Year level engagement

It was a terrific activity to build community within the Year 7 cohort. A little bit of healthy competition. A great afternoon activity with buy in and ownership from all involved.

## d. Parent and wider community

It was great to see parents come and watch on the competition day. They really enjoyed themselves and could see the value in this type of activity.

We were also contacted by a local primary school to be involved in their Science Expo after they saw the article in the local newspaper.

## e. Whole school staff and student interest

While involvement of the entire year level at the one time meant that students were taken away from their normal classes, the activity was seen as valuable not just from a science point of view but from a whole school community aspect. The competition afternoon was visited by many staff across the college who came to witness the activity.

---

# Learners' voices

You have to work together to get things done

I learnt a lot about the outcomes of gravity and how it can change speeds a lot

Difficult way but interesting way of learning

Better learning this way than doing theory

It was nice to work with new people who could have fun but still work hard

I learnt that I am an OK collaborator

I got to know people more that I didn't already know

Working with different people is fun

My team mates were great, I really enjoyed working with them

You have to be persistent to get it to work

I learnt that I am not the best collaborator. I think that it wasn't the greatest way to teach us

I didn't expect to be doing things like this in high school.  
It was a great and memorable experience.

It made you think creatively

I prefer to work alone. It was hard to tolerate people. I didn't get any science out of it. I prefer pracs and theory.

Rube Goldberg machines are cool but super frustrating

Trial and error is a big thing

Being collaborative is an important part of working well with other people

I learnt that thinking outside of my comfort zone is difficult

Being collaborative can take time and is harder than I thought

I liked it so much better doing hands on things because we got to experience the thing instead of reading them in a book

# Teacher's voices

## General Comments

- Friends don't necessarily work well together.
- Really mature group took in an autistic child – very inclusive.
- Most students were really engaged.
- Really progressed towards the end when the pressure was on.
- Some groups really struggled to work collaboratively.
- It was good to have a change from our normal teaching method.
- Our focus was on the collaboration so maybe not enough focus on the Forces part of the work, though the students could speak well about the forces used if it was made explicit in the class during their work.
- Limited access to You Tube was big inhibiting factor for some groups.
- Collaboration - Need to do more work on explicit teaching of different roles.

**Anna** - This activity was a wonderful experience watching how various groups interacted together. I think now that I have done it once I would attempt it again and would group my students in a similar fashion where I randomly numbered the students into groups. However I think I would structure it a bit differently by describing roles more clearly in the groups and by setting regular checkpoints for progress. I think I would also look to provide more structure around what was to be achieved. Overall I loved the task and the experience and so did the kids.

**Erynne** - I really enjoyed the Rube Goldberg challenge with my year 7 class. I enjoyed the business and activity of the students, as well as the creative ideas they put forward. I enjoyed the teaching of the collaboration and Solution Fluency concepts, although I think I need more practice to do this more effectively. I found that some of the groups worked together really well, whereas others did not collaborate effectively and argued about ideas a lot. In addition, one of my groups didn't complete the machine because they changed their ideas every lesson. The idea of a competition really motivated most of the students, although one group only got their machine working on the actual competition day.

It was particularly pleasing to see my student with dyslexia fully engaged in this activity and see him achieve success. I was also encouraged by the inclusiveness of one group who actively chose to incorporate/investigate my dyslexic student's ideas, even though some of his ideas weren't manageable.

Overall I found the activity was rewarding for most of the students and I would love to do it again with another class. I'd really like to try it with an older group to see how their maturity level affects their collaboration skills.

**Debra** -All students were very enthusiastic with this task. I let the students choose their own group with three people in each group. I found that although the students were very keen to work on this machine, many groups were not organized to bring in any equipment they needed and most relied on me organising cardboard, tape, wood etc. for them. I found that absences were a problem with only one member of the group present to work on the task occasionally and there was one boy who was on his own on the day of the competition due to absences and another group that had two members present at the start but then one went home early to leave another boy on his own. I found that some groups used so many dominoes and that because of that it took a long time to set up each time they let the marble go etc. I think because of this factor, no groups got close to the time they were aiming for, they kept trying to get consistency with the start of the machine and didn't move on to make the machine run for a longer time. One period a week we were in a classroom in C wing and had to get our machines from A wing and return them by the end of the period which lost valuable time for working on the machine. The competition was held during our Science class so we got less time to work on the machine. The fun factor was great but the cooperation amongst most teams was not and I don't think they learned much about forces. Maybe more value from it if they had learned more about forces first.

# Teacher's voices

**Steve** - As you know, I don't feel my class got a lot out of the project, so you may not want to include my reflection (or feel free to just take parts of it).

I'm yet to be convinced that collaboration is a worthwhile thing to explicitly teach. (that's not to say I won't be convinced some day). I see collaboration as a skill people naturally pick up as they reach the right level of social maturity and in the right circumstances. (A bit like learning to walk. No point pushing a baby into it. It will happen when the time is right). Some of my class were too immature and more worried about friendship groups and social dynamics to make progress. Some were dominant, taking over and forcing their view. Some sat back and contributed little. Like any of my classes, some were probably just plain lazy or resistant to participation. It's fair to say I didn't have the skills or experience to move many of these students along much. I'd say about 5 or 6 of my class realised a tangible benefit in term of learning to work together and collaborate. Unfortunately there was also a few academically high achieving science students who had a bad experience from the project. It is these students who I worried about during the project. Did you see the CSIRO scientists doing the media rounds regarding the Pluto flyby? There was a team of 92 engineers, technicians etc. These people were collaborating amongst themselves and NASA beautifully. I bet they didn't learn how to collaborate at school. I bet some hated working in groups or teams at school. Of course, many would have discovered and developed their love of science and technology at school.

Steve (old stick in the mud).

**Delia** – As the NPDL School lead, I was keen to run a project that gave teachers the opportunity to experience and teach differently. It is easy just to keep doing things the way we always have, change is hard. I also wanted to have a go at seeing if it was possible to accurately assess student ability in areas where there wasn't a specific test. (Using the New Measures)

There is no doubt that this project challenged staff and moved them outside their comfort zone. Each teacher had a different experience ranging from loving the whole idea and wanting to try it more often (doing similar activities will give the chance to get better at it), to thinking it wasn't very valuable at all and that not much learning took place.

It is interesting to note that the teachers more accustomed to working with younger students saw more value in the learning than those more accustomed to higher level teaching where there is more of an emphasis on subject specific content than learning attributes.

It was also very clear that we cannot assume students can collaborate just because we put them in teams to do group work. Good collaboration requires many different skills, including good communication and critical thinking and it is imperative that we actually teach students about these skills and what they look like. In a secondary school environment, until teachers see the need to do this, the content driven learning will always take precedence.

Personally, I really enjoyed this opportunity. It was a challenge for me to ensure that the content area was covered as well as the aim to improve collaborative skills. While I could have taught about Forces in a third of the time it took us to do the project, I am sure my students are more likely to remember their Rube Goldberg challenge when they leave school than they are about Forces. I will use every opportunity I can to develop their Collaborative skills in future classes, weighing up the deep learning value/time/learning with the content requirements.

# Partners' voices

<http://www.standard.net.au/story/3082549/complicated-answers-to-simple-problems/>

## THE STANDARD



Wednesday July 8, 2015

News

Aa Larger / Smaller

### Brauer College science students over-engineer their solutions

By JONO PECH May 16, 2015, 4 a.m.



BRAUER College students channelled their inner mad scientist yesterday as they competed in building Rube Goldberg machines.

Named after an American cartoonist and inventor, the devices can be any over-complicated contraption designed to perform a very simple task through chain reactions.

Science teacher Delia Jenkins said the year seven students were applying theories of physics to construct each apparatus.

“The Rube Goldberg machine is something sophisticated that does something very simple, like turning a switch or blowing out a candle,” she said.

“We’ve been learning about different types of forces and how they work.

“The machines can be built from anything you want and most students have brought a lot of stuff from home.

Harry Moss, 12, said his team’s project took several weeks of planning and building to produce the final result.

“The aim was for it to last 20 seconds using whatever we could find,” he told The Standard.

“Ours was built on an angle so the marble has enough speed to keep going but we had to muck around and experiment with it until we got it to 20 seconds.”

Rachel Johnstone, 13, said the complex machines could consist of almost any household materials, including dominoes, cardboard, marbles, children’s building blocks and metal plates.

“Most of it is about force and predicting how it’s going to land,” she said. “We started with a ramp and added different parts with ideas we found on YouTube.”

# Partners' voices

Well they never did science like this when I was at school! My son Stephen had been telling me for weeks about the concerted efforts of himself and 3 classmates to construct a Rube Goldberg machine... so I just had to nip up to the school and see what the fuss was about! Nearly 2 hours later I left and went back to work fascinated, intrigued and ultimately very impressed with the children's imagination in coming up with some amazing contraptions. On display was the teamwork in working together to make the machine and setting it up time and time again while time testing; a passion for learning and experimenting, a fun activity that was measurable and exciting, fierce competition mixed with respect for the cool creations of other teams and a fun maths / science lesson which introduced many different laws of physics. I told my wife about it (who couldn't attend on the day) like an excited schoolkid myself! Merrivale Primary schoolchildren have just done their own Rube Goldberg with grade 5s and it really captured their imagination too and is a Fantastic idea!

- Parents



I am the mother of a year 7 student at Brauer College. Last term my son came home and explained that the year 7's were doing a project called Rube Goldberg. He went to show me examples of the inventions that were on the internet. He was excited to be doing something that was hands on and up to his imagination. During the time the project was underway, I spoke with a couple of his mates who were also enjoying the experience and were looking forward to the test day to see who had the best creation. He resourced most of the items from everyday items that we had at home. I did get him some plastic tubing, which I believe he shared with other groups that wanted to utilise it in their designs. I arrived on the day of the test day and was met by many very excited year 7's all in a healthy competitive mood. There were some amazing designs and all were very unique in their ideas. This was a very successful project that encouraged the kids to be creative and work together in groups. The group work proves to be a good learning tool, in that one needs to be diplomatic when working with others who have their own thoughts and opinions. Though my son did not have the best invention, he was very appreciative of the ideas that were more successful than this group.

# Partners' voices

- Matty Stewart – Coast FM



Two of the participating students spoke on the morning radio breakfast show, explaining about our Rube Goldberg project.

I was asked to be part of the Rube Goldberg Competition day at Brauer college in which Year 7 students were tasked with coming up with an idea for a Rube Goldberg machine that could finish as close to 20 seconds as possible. The key factors were the ability to work as a group or team, to share ideas and be creative when building their Rube Goldberg machines. The student engagement and the excitement was absolutely amazing and to see the flare of the kids was unbelievable. I didn't know what to expect but I walked into a room of 120 kids that were full of happiness and eagerness to show off their creations and test them against each other. It was a great assignment and a fun way to look at a Science project in a fun environment. Full credit to all involved.  
Cheers

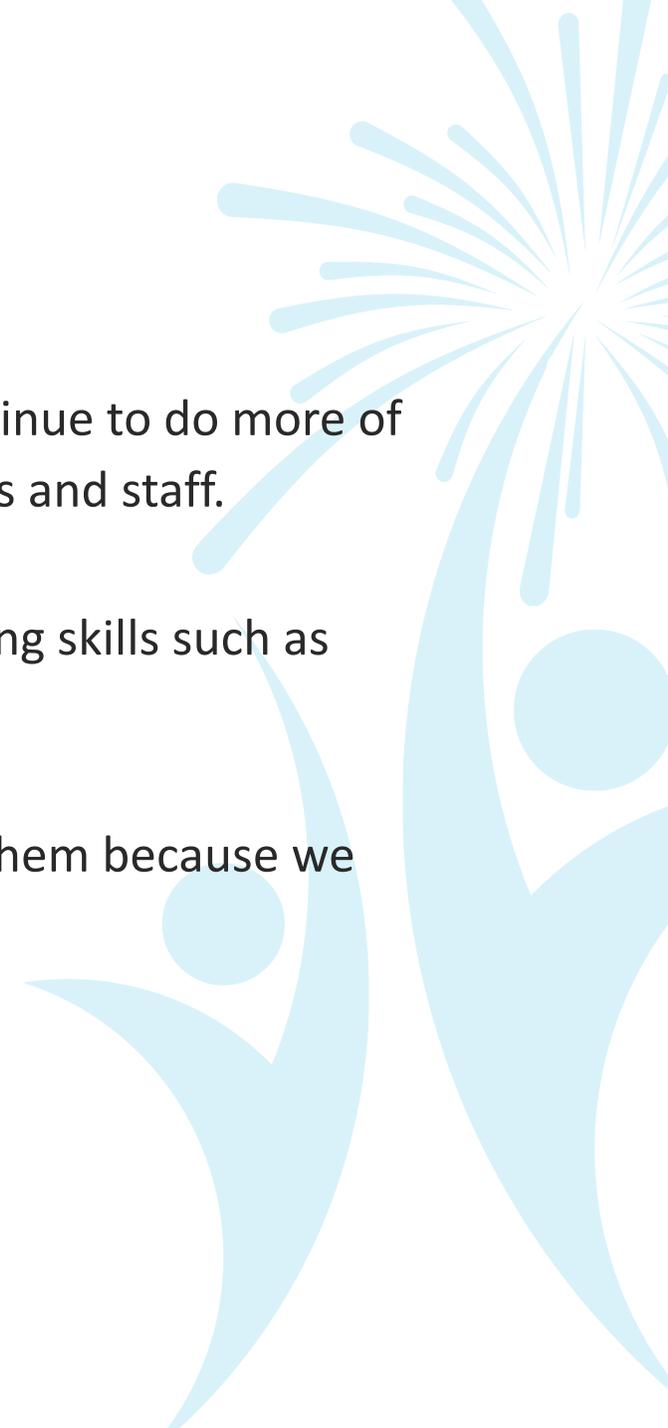
Matty Stewart.  
Coast FM Breakfast Announcer.

## Final Comment

Our students (and some teachers) are very poor collaborators. We need to continue to do more of these types of activities to help develop more collaborative skills in our students and staff.

To be good collaborators students also need to have other contemporary learning skills such as character, communication and most importantly critical thinking.

We need to explicitly teach these skills, students don't just get better at doing them because we give them 'Team' tasks.



## Credits, acknowledgements and permissions

Warrnambool Standard – Newspaper article on May 16<sup>th</sup>, 2015.

Photos as supplied by classroom teachers.

Matty Stewart – Coast FM Warrnambool.

Parent Comments – Justin Allen and Trudy Moreland.

Permissions have been sought for all images, audio, video footage and student work featured in this presentation.

