bridgewater primary school

innovation research report 2012

Bridgewater PRIMARY SCHOOL

Executive Function:
Developing School-based learning experiences that shape Working Memory, Inhibitory Control and Cognitive Flexibility.

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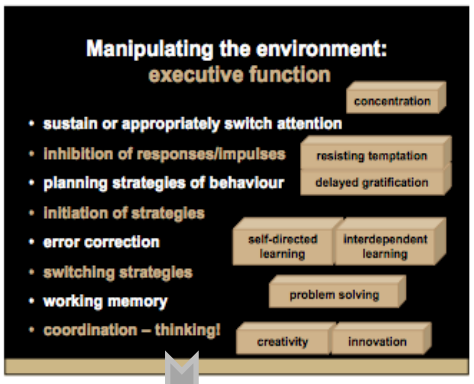
School Context

Bridgewater Primary is a Reception to Year 7 public school nestled in the beautiful Adelaide Hills. We have around 160 children from a diverse range of family backgrounds. We have a strong culture of **voice, choice and relevance** in learning. One aspect of the school culture is the expectation that children will learn to be **better thinkers**, who consider **important questions** about **their place** in their close communities and the wider world, through *Community of Inquiry, philosophy and Personal Learning*. We learn about our brains and how we can **shape them** to help us learn better. We learn about our emotions and how we can understand them to help us be **happy, optimistic, successful,** and **get along** better with each other.

Research Background

In a presentation to the BPS community (staff and families, 21st February 2011) Professor Martin Westwell talked about Executive Function. Professor Westwell defined Executive Function (EF), talked about how it can be identified in children and the critical role it plays in determining success at school and in later life. Professor Westwell used this graphic to help us understand the nature of Executive Function:



Inquiry Question

Professor Westwell's presentation prompted the question:
Can we design learning experiences <u>with our children</u> that mindfully and explicitly shape and develop their Executive Function?
This became the focus of our practitioner inquiry.

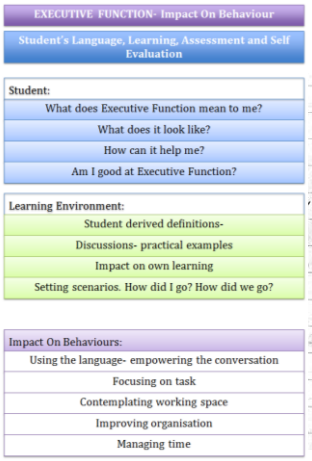
Executive Function – our working definition

Teachers read the article *Building the Brain's Air Traffic Control* and began using the definition of EF as cited in this article.
Working Memory: the capacity to hold and work with information in our heads over short periods.
Inhibitory Control: the skill to control and filter our thoughts and impulses so we can resist temptations, distractions and habits and to pause and think before we act.
Mental Flexibility: to be able to switch gears and adjust to changing situations, demands, priorities and perspectives. This means we can respond to different rules in different settings, e.g. home and school.

Building the Brain's "Air Traffic Control" System. Working Paper 11, 2011

Research Design

- Teachers and children engaged in shared reading of articles about Executive Function (EF) and discussed ideas for learning design
- Staff worked with Professor Westwell during a Learning Team and two staff meetings to learn more about EF and to share their practice
- Teachers designed learning experiences for and with their children, trialling strategies, collecting data and anecdotal observations, and sharing learning within teams. Each Studio approached the inquiry differently, with a variety of learning strategies and data designs. These included:
  - Student data collection sheets; where children noticed themselves using aspects of EF and recording; analysing patterns and trends
  - Metacognitive journals, informed by data, observation and feedback
  - Surveys and behaviour data
  - Self and peer review, reflection and goal setting
  - Students as film-makers, chronicling learning design with behind the scenes review of how these experiences helped develop EF
  - Observing children during imaginative play.



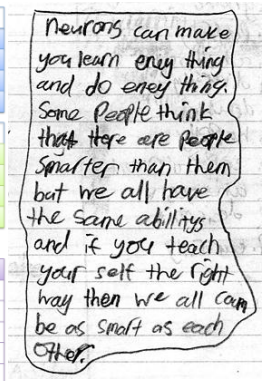
EXECUTIVE FUNCTION- Impact On Behaviour

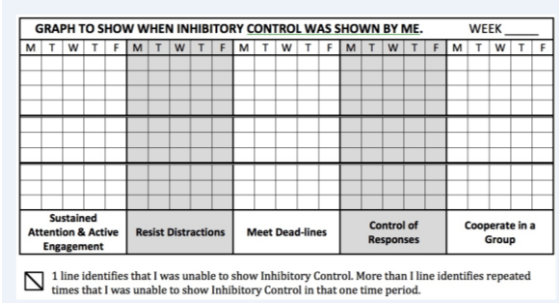
Student's Language, Learning, Assessment and Self Evaluation

Student:
What does Executive Function mean to me?
What does it look like?
How can it help me?
Am I good at Executive Function?

Learning Environment:
Student derived definitions-
Discussions- practical examples
Impact on own learning
Setting scenarios. How did I go? How did we go?

Impact On Behaviours:
Using the language- empowering the conversation
Focusing on task
Contemplating working space
Improving organisation
Managing time



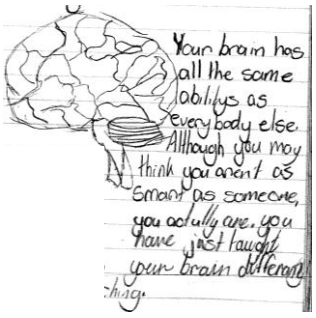


GRAPH TO SHOW WHEN INHIBITORY CONTROL WAS SHOWN BY ME. WEEK _____

M	T	W	T	F	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F
Sustained Attention & Active Engagement					Resist Distractions					Meet Dead-lines					Control of Responses					Cooperate in a Group				

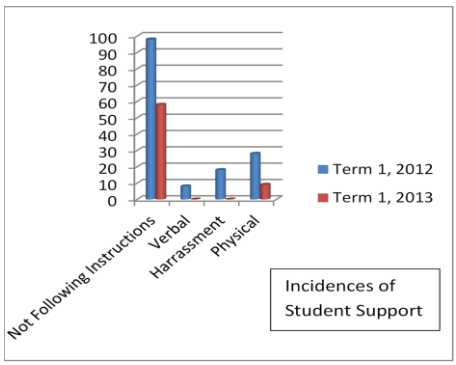
1 line identifies that I was unable to show Inhibitory Control. More than 1 line identifies repeated times that I was unable to show Inhibitory Control in that one time period.

Student responses to data:
"Now I think about these things when I didn't used to but I do find it hard to ignore distractions. I am getting better at using my working memory." Kai
"At my old school I didn't cope well when I made mistakes. Now I just cross it out and do it again until I get it right. I think I improved managing my time the most." Tayah



Results

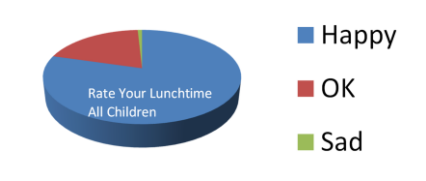
- Children identified and articulated improvements in learning and behaviour as a result of understanding, 'noticing' and taking more responsibility for their own behaviour and responses.
- Children developed their understanding of self-theories in learning as a self-fulfilling entity; i.e. being smart is something you do and get better at through practise and work, not something you have or don't have.
- Student Behaviour Support: 59% reduction in children needing support for 'not following adult instruction'. This category includes children who are not focussing on their work or causing disruption in class. This supports what children are telling us about how their understanding of Executive Function helps them notice their behaviour and mindfully modify their thinking, actions and interactions.



Having Executive Function in the brain is like having an air traffic control system at a busy airport to manage the arrivals and departures of dozens of planes on multiple runways.

Building the Brain's "Air Traffic Control" System. Working www.developing child.harvard.edu

- We surveyed all children regarding their sense of belonging, relationship and safety during playtime as one way to ensure children have a strong voice in shaping their experience at school and to help us have an overview of how children were functioning in a less supervised space, (i.e. not the classroom.)



- The survey results for new Reception children helped us gauge how older children were managing themselves in the yard. We believed the new children would be sensitive to older children who were not exercising their Executive Function, making the yard uncomfortable or even frightening. 98% of our Reception children rated their lunchtime as happy.

Unfortunately, play has changed dramatically during the past half-century, and according to many psychological researchers, the play that kids engage in today does not help them build executive function skills.
Alix Spiegel 2008

- Read Up and Quick Smart; programs designed to ensure automaticity in aspects of number operations and frequently used words to free up Working Memory for more complex tasks showed significant short term improvement in more than 90% of children.
- Children were articulate in their explanations of why Community of Inquiry and the process of thinking 'out loud together', and drilling down into their own and each other's thinking in a disciplined, respectful way helped exercise and grow EF.
- Observations of children during imaginative and creative play generated greater interest in learning more about this aspect of EF

Conclusion

Our research at BPS confirms for us that having robust Executive Function is critical to a child's success.

We wanted our children to do more than **know about** EF. We also wanted them to engage intellectually in the experiences that develop these important capabilities.

While we are in the very early stages of our understanding, it seems clear to staff and students at this school that many of the strategies we trialled had a positive impact on children's demonstration of EF and achievement, including;

- **Learning** about aspects of neuroscience, e.g. what is EF, what does the research show about later outcomes for children who demonstrate strong EF, what does neuroscience teach us about fixed and growth mindsets (Carol Dweck)?
- Scaffolding to help children **notice** their own EF behaviours, collect, collate and analyse personal data, select aspects to work on and plan for success.

Our inquiry unearthed opportunities for improvement in practice across the site, leading to next steps that include;

- explicit teaching of mediation skills,
- strategies for noticing and taking responsibility for behaviour changes in themselves (Behaviour Scale)
- more thinking, research and practitioner inquiry around developing children's automaticity of EF skills
- increasing our understanding of imaginative and creative play strategies that develop EF.

According to Dweck, people's self-theories about intelligence have a profound influence on their motivation to learn. Students who hold a "fixed" theory are mainly concerned with how smart they are—they prefer tasks they can already do well and avoid ones on which they may make mistakes and not look smart. In contrast, she said, people who believe in an "expandable" or "growth" theory of intelligence want to challenge themselves to increase their abilities, even if they fail at first.

"Psychologists speak of "executive control" to describe the adoption and termination of task sets, and neuroscientists have identified the main regions of the brain that serve the executive function. One of these regions is involved whenever a conflict must be resolved. Another is the prefrontal area of the brain, a region that is substantially more developed in humans than in other primates, and is involved in operations that we associate with intelligence."
Daniel Kahneman

References

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Building the Brain's "Air Traffic Control" System. Working Paper 11, 2011 www.developing child.harvard.edu

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New study yields instructive results on how mindset affects learning
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