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Problem Solving and developing Executive Function in the young brain

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“In order for young brains to retain information, they need to apply it.” (Willis, 2014 p.1). It is clear that when you provide students with opportunities to apply learning through real life experiences, facts move from rote memory to become part of the memory bank. Figure 1 demonstrates this learning chain of events:

Figure 1 Creating a Memory Bank

Authentic, personally meaningful activity



Isolated small neural networks of facts or procedures



Cellular changes of neuroplasticity



Larger neural circuits of related information



Consolidation of information into networks



Activation of networks to use new learning to solve problems



Promotes further network activation



Construction of long-term memory

As the flow chart in Figure 1 depicts, retained learning begins when a young brain personally experiences an authentic meaningful activity. Said activity creates small neural networks of facts or procedures. With cellular changes in neuroplasticity these networks form larger neural circuits of related information. These larger circuits of information consolidate into networks of information and in turn these networks can be activated so the new learning can be used to solve problems. The use of these activated networks in problem solving promotes further network activation which creates pathways forming the construction of long-term memory or memory banks. These activities or processes describe “Executive Function”, the general term that encapsulates the regulation and control of these cognitive processes.

Executive function begins to develop in childhood, through adolescence all the way to early adulthood. “Difficulties with executive function are typical in childhood and adolescence but are especially challenging for youth with autism, ADHD, Conduct Disorder, PKU kids etc.” (Zelazo 2011, p.11) These difficulties can manifest in the form of all types of problem behaviors. Some examples of these are: trouble in making plans, evaluating ideas and being able to reflect on them, as well as memorizing and retrieving information from memory.

Dr. Larry Brendtro explains that, “The logical brain matures slowly, beginning in the rear sensory-motor areas. Language and social areas develop profusely throughout childhood. Last to mature is the frontal cortex that handles executive function. It serves as an orchestra conductor to keep all brain functions in harmony. This includes managing emotions, planning ahead, and making wise decisions. While survival and emotional brain capacities operate from birth, the logical brain takes more than twenty years of cultural experience to mature.” (Brendtro, Mitchell & McCall 2009 p 32)

Careful observation and trial teaching are the best way to evaluate problems with executive function. (Editorial Team, NCLD, 2013). Once this methodology has been established, Executive Function lends itself to Problem Solving Training by providing cognitive skills to:

- 1) Name and identify or “define the problem”
- 2) “Make a plan” to solve the problem
- 3) Execute: “carry out the plan”
- 4) “Evaluate consequences and outcomes” of executing the plan.

The problem identification step, in specific, addresses the first two. It helps to develop judgement, prioritizing in order to properly plan, setting goals, using and transferring prior knowledge and providing self-feedback. These are all higher thinking skills that provide opportunity to develop executive function. (Willis 2014).

To maximize on our opportunity to build on youths’ executive functioning, the following is a detailed description of facilitation techniques for Session IV.

Session IV: Problem Identification

Materials:

- Problem Solving Worksheet 3
- flip chart/smart board/chalk board
- different coloured markers

Introduction and Review

Review the Problem Solving steps already taught (see Parker, Calame, Gundersen, Simon, Choi & Amendola 2013 pg. 49/50)

The facilitator explains that, before using the key elements of this problem solving step, the youth/identified trainee must first narrow down and focus on what s/he wants to work on.

Explain to the group that, first, one has to:

- (a) Define the problem
- (b) Break down the situation into parts by separating the irrelevant or unimportant information, primary goals and major obstacles.

As the facilitator, our role is to guide this process, making it clearer as we go through the steps with her/him and the group. The key in this piece is to make it relatively simple and straightforward.

At the top of the flip chart (smart board or the like) write the title of the session, in medium size block letters (note: henceforth all writing/letters will refer to block letters). Underline the title.

Problem Identification

Below it, in larger letters, write down,

Problem =

Ask the group for their definition of a problem, as a review as well as to ensure that there is a clear understanding of what a problem is. Have them share some examples of common types of problems and write them down. Once you read their definition find common links to reinforce:

Goals + Obstacles = Problems

Once this is established then explain how to use the equation by breaking it down into four parts. Tear off the above paper and post it up somewhere nearby for reference and visual aid.

Using a new sheet, rewrite the title:

Problem Identification

Under this heading, write the following four questions, equally spaced over the full page/board space.

(Note: the numbering is not essential but easier when explaining the process)

1) What is my goal?

2) What don't I like?

3) What are my obstacle(s)?

4) What do I need to change?

The process we go through next is the heart of the Problem Identification exercise. Answer each of the questions in sequence.

Beside "What is my goal?" have them pick **one** goal and write this down, using a coloured marker. To maintain clarity, avoid recording more than one goal. Make sure that it is legible but not too large as you will need to save space for more written work.

(Note: As participants talk, and although we earlier defined the problem together, they sometimes start brainstorming or going off on tangents. It is important, however, to keep the group focused)

Continue with the next question, "What don't I like?" which may have several points. Using the same colour, write down what they feel and try to steer them clear of blaming others, unless absolutely necessary. If so, write it down in smaller lettering.

Although we do not touch much on this point again in this exercise it can be used to clarify several points:

- How do they feel about this goal/problem? Is it motivating to try to work on/resolve this issue?
- It clarifies external and internal triggers,
- Are there any thinking errors, are they blaming something/someone beyond their immediate control?

"What are my obstacle(s)?" , question three, is where, once the feeling(s) is acknowledged in the preceding question, we can encourage participants to share concrete examples of what they think is holding them back from getting beyond their problem. They may raise one or more obstacles; try keeping the list to 3-5 items, but do not hold them back. Write these down using the same coloured marker.

(Note: Others in the group may be tempted to blurt out answers or share their opinions or similar situations. Keep the group focused by asking/directing them to minimally wait for the

problem owner to finish her/his part first.) If other points of view are shared, ask the problem owner if any of the opinions are relevant and/or necessary. Omit or strike out the ones which are unnecessary.

In the last question, “What do I need to change?” the participant shares what they, at that precise moment, feel needs to be done about the problem. (Note: Because this point has become a mental and visual process that engages their frontal cortex they may hesitate and/or answer reactively or use their habitually used response)

Whatever their answer is, write it down, using the same colour marker.

At this point everyone, including the facilitator, should step back to look at what has transpired so far.

We review, reflect and continue with the process of repeating the steps as necessary. As one looks at the changes needed to be made, it may become apparent that the goal needs to be changed/adapted. Using a different coloured marker, return to the first question, scratch out the original goal, and add the new goal. Proceed back through the remaining three steps, using the new colour. This procedure may be repeated until the youth is satisfied with, and capable of accomplishing, the change.

Providing a tangible illustration of their reasoning processes helps to nurture and build the executive function necessary for cognitive long-term deep brain learning, forming new, more beneficial, habits.

Sample Problem Identification Phases

The following case samples are examples of “Repetitive Reflective Process Learning,” (RRPL) an evolution of Reflective Practice, “the capacity to reflect on action so as to engage in a process of continuous learning”, as first introduced as such by Donald Schon, (Schon, 1983). This term, now widely used among health professionals, is the basis of what we are calling the RRPL. It is our version of Reflective Practice, a model for helping youth and individuals to better problem solve, specifically with the Problem Identification process, initially with support and eventually on their own.

To show each repetitive step clearly, they are broken down below in three separate phases:

Problem Identification Sample #1:

First Phase

Problem:

Poor relationship with son

Goal:
son

Improve relationship with

Don't Like:

When son is mad at me:

rejects me
sulks

Obstacle:

Temper/anger

Not enough support from

wife

Change Needed: Take 3 breaths before speaking



Second Phase:

Goal:

Improve relationship with son
Learn to stop and breathe

Don't Like:

When son is mad at me:

rejects me
sulks

Obstacle:

Temper/anger

Not enough support from wife

Lack of patience, impulsiveness

Change Needed: Take 3 breaths before speaking

Practice



Final Phase:

Goal:

Improve relationship with son
Learn to stop and breathe

stressed out times

Practicing to stop and breathe during

Don't Like:

When son is mad at me:

rejects me
sulks

Obstacle:

Temper/anger

Not enough support from wife

Lack of patience, impulsiveness

Reverting to cultural and practiced norms/personal logic e.g.
punitive discipline

Change Needed: Take 3 breaths before speaking

Practice

Practice

Problem Identification Sample #2

First Phase:

Problem:
early

I have to come home too

Goal:
home when I want

I want to be

Don't Like:
to be told what to do

I don't want

Obstacle:
must come home

The time my parents say I

Change Needed:
parents give in

I can argue until my



Second Phase

Goal:
home when I want

I want to be

I want my parents to be clear about what they
want me to do

Don't Like:
what to do

I don't want to be told

My parents are unclear and then give me
consequences I have not expected

Obstacle:
must come home

The time my parents say I

Mixed

messages from my parents

I don't pay

attention because I am "in the moment"

Change Needed:
parents give in

I can argue until my

Think about what the next day will look like
(Think Ahead)



Final Phase

Goal:
home when I want

I want to be

I want my parents to be clear about what they
want me to do

consequences of my actions

Evaluate the

Don't Like:
to be told what to do

I don't want

My parents are unclear and then give me
consequences I have not expected

Obstacle:
must come home

The time my parents say I

| | |
|--|---|
| | Mixed |
| messages from my parents | |
| | I don't pay |
| attention because I am "in the moment" | |
| | None |
| Change Needed: parents give in | I can argue until my |
| | Think about what the next day will look like (Think Ahead) |
| | Practice |

The changes in colour reflect the development of the Problem Identification process; we change colours to highlight to the MP's evolution of her/his problem, towards a "change needed" that is more possible and probable to her/him.

Note: The third and final phase of the example is the overview and representative of the single work page that the facilitator will help the trainee write up (i.e. written above in red).

As seen above, the whole chain of changes, the Repetitive Reflective Process Learning, comes into play and evolves into a more effective solution, when doing it with a facilitator/mentor and/or alone.

We teach the trainees to think beyond their normal circular thinking or state of being "stuck". As Chris Argyris describes the concept of **double-loop learning** (DLL) in which an individual(s) "is able, having attempted to achieve a goal on different occasions, to modify the goal in the light of experience or possibly even reject the goal." (Argyris & Schon, 1978)

The process of doing it repetitively to evolve their thinking, on paper, and to visualize their problem is a typical Experiential Learning (Kolb & Fry, 1975) reflective model. Just thinking one's problem over and over often leads to simple solutions as most individuals cannot keep all of their thoughts organized in their minds when solving a more complex matter.

Our RRPL model is also representative of the whole Problem Solving skill, of Graham Gibbs' Reflective Learning Cycle (Gibbs, 1988) which in turn is his adaption of Kolb's Reflective Model (1984).

Christopher John's "Structured Mode of Reflection", with a colleague or mentor (Johns, 1995) is closest to what we do. The facilitator and/or the group support and help the problem owner develop their "change needed" (as is the facilitator's teaching and support of the Problem Solving process).

As is illustrated in the processes above, problem solving is clearly a step by step system. First comes a careful examination of a problem one faces and its make-up. By setting a goal and reflecting on the goal and the obstacles that prevent attaining it, the problem solver puts him/herself in a good position to proceed. This Problem ID phase of the process sets up the following parts of the process in a clear and definable way. Once the ID is clear the solver is set up to brainstorm possible effective solutions, picking one that appears a likely good one and trying it out. If that doesn't work, good Problem ID dictates repeating that process until the outcome is satisfying is logical and well informed. The Problem ID step to the problem solving formula is extremely valuable. It underlines the issue at hand, allows for reflection on the dilemma and then provides a repetitive strategy of trial and error until the problem is resolved. The authors bid you well with this strategy and strongly suggest you pay special attention to the Problem ID part of the process, remembering that this process can be useful especially in developing Executive Function in the young brain.

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