Keeping the Memory Alive
Preventing Memory Loss that Contributes to Process Safety Events
Introduction

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  - Over 28 years of industry experience
  - Operations
  - Asset and Operating Integrity
  - Process Safety and Risk Management
    - Summary of thesis for M Sc. Safety, Risk and Reliability Engineering
The Problem We Face

- Gerstein – organizations fail to learn from past errors; across industry and within same companies
- Kletz – contributing causes are repeated
- Mannan – memory within an organization decays allowing repeat accidents

Realize I’m probably preaching to the converted here........

Gerstein - ....and this allows accidents to repeat

Kletz - .....has seen this time and again where could have simply pulled list of contributing causes from files of previous accidents already forgotten

Mannan - ....memories that should help us just aren’t there
1. First task - Understand the problem
2. Determine method to solve it (developed as I went – didn’t really have a plan – was a little afraid as I set out in faith that I could find something)
3. The solution I found - (apply method to CPC)
Research: Major Historical Process Safety Events

Overview

- Piper Alpha, Longford, Texas City, Flixborough, Bhopal, Pasadena
  - Common contributing factors – Management of change, hazard assessment, procedures, isolation of equipment for maintenance, utilizing lessons learned, sense of vulnerability
  - An inability to remember and learn from the past

Very high level overview
HSofV – to believe that something that hasn’t yet caused a problem can still be a dire incident in the making

- good ex of this is High Reliability Organizations (nuclear, aerospace, airline) – never put their guard down (their culture)

- a caution - without this HSofV - current success can actually make future success less probable
3 years memory retention:
- unless personally involved
- unless extreme significance
- unless other similar event had occurred and brought back memory of the older event

Are we missing something? – we were doing lots of good things:
- investigations
- bulletins
- training
- recommendations acted on
- But ineffective in keeping the memory alive
From best practices – “to not forget about old accidents” – so first off I wanted to try understand why we forget, or why we remember something

3 keys:

Original awareness – need to actually remember it in the first place, not just hear it (in and out) – i.e. need an association created

Triggers – links created in LT mem that allow the mem to be pulled back when needed

Effectively create in LT mem:
- need to get it to LT mem, through the working mem, to make it stick
- working mem is used when something is thought about
- 2 different types of working mem – verbal and visual - when both of these used in creating a memory, more triggers in place to aid in recalling the mem, and any of these triggers will help to recall it
- working mem then retrieves memories from LT mem as needed
Looking at the **Cognitive domain** - Domain of learning that primarily engages the intellect to understand and apply concepts

But focus on **Affective domain** - Domain of learning that primarily engages emotional factors and attitudes of the learner

**Overview Drawings** – Dr. TJ Larkin - simple and great, but research brought me to even add more focus on targeting this affective domain – speculation appeals to this

**Taxonomy Table** : Educators have been using this aid for over 50 years
- lays out interrelationships between cognitive and knowledge dimensions
- helps teachers set objective and then plan training in a manner that achieves objective

**Objective statement** – carefully prepared using an analysis process to determine a specific verb and noun (will show you in a minute)

**Determine** Current state (of student or organization) and Desired state

**Develop** learning curriculum to move from current state to desired state
## The Taxonomy Table

<table>
<thead>
<tr>
<th>The Knowledge Dimension</th>
<th>The Cognitive Dimension Process</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Remember</td>
</tr>
<tr>
<td>Factual Knowledge</td>
<td></td>
</tr>
<tr>
<td>Conceptual Knowledge</td>
<td></td>
</tr>
<tr>
<td>Procedural Knowledge</td>
<td></td>
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<tr>
<td>Meta-cognitive Knowledge</td>
<td></td>
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</tbody>
</table>

Table 1: The Revised Taxonomy Table

Quick look at Taxonomy Table
Quick look at Cognitive Dimension – the desired verb is chosen from here
Knowledge Dimension table – noun expected to be acquired by students is chosen from here – then objective statement is created, using the chosen verb and noun
This is the Taxonomy Table as developed for CPC

Start with Objective statement – then current state as per CPC review – then explain how learning activities were developed to advance the learning from current state to desired state.
Developing a Learning Curriculum

- Led to an education company specializing in e-learning
- Design learning activities to develop both affective and cognitive domains
  - Target memory retention
  - Use knowledge gained of memory
  - Use knowledge gained of effective communication
  - Build learning into processes
  - With time comes new culture

Teachers and education specialists on staff, and graphics designers, programmers – they work together on a project

Took my knowledge gained of memory, effective communication, past CPC PSE’s – worked with them to build all these learnings into a curriculum to advance learning from current state to desired state

Now share with you the Learning activities developed for CPC
Teaches what has happened in a manner that stores in LT memory with various triggers for recall when needed

Have removed text, otherwise would include
- what happened
- the causes
- what else could have happened – Speculation adds to memory retention
Learning Activity Two

- To understand factual knowledge
  - Help students understand how past PSE’s specific to their job function have developed
  - Overview drawings into processes
    - i.e. onboarding new inspectors
    - i.e. link to maintenance generating system
    - i.e. link to Safe Operating Practices
  - Teaches what to prevent
Learning Activity Three

- To apply factual knowledge
  - Help students implement their understanding of contributing factors
  - Process Safety course that keys on contributing factors of past process safety events

Develop course that speaks to the contributing factors and prevention techniques
- procedures
- MOC/PSSR
- Hazard recognition
- PSI
- Learning from the past
- Sense of Vulnerability
Learning Activity Four

To understand conceptual knowledge
- Help students understand the underlying causes of PSEs
  - What Process Safety is, prevention barriers, Swiss cheese model, how students can affect Process Safety – as part of Process Safety Awareness course

Course that ties it all together
- What Process Safety is
- What PSE’s are
- Prevention barriers and swiss cheese model
- how they can affect Process Safety
Process Safety Course
End goal to change the culture, which should be one of remembrance of past PSE’s and apply the learnings.
QUESTIONS?

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