



# TRIZ Utilization Survey

Preliminary Data Analysis

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4/7/08



# Agenda

- Survey Background
- Analysis Background
- Data Analysis Question Results
- Summary of potential responses by Intel
- Next Steps
- Back-up – Comments Recap

# Survey Background

- Survey was created with the goal of better understanding the personnel and organizational profiles that lead to higher rates of post training TRIZ based problem solving.
- The survey consists of 33 questions:
  - 5 demographic questions
  - 13 questions aimed at all TRIZ trainees
  - 5 questions targeting information at the Basic TRIZ level
  - 5 questions targeting information at the Advanced TRIZ level
  - 5 questions targeting information at the Expert TRIZ level
- Questions were designed to gather information about:
  - Demographics of active TRIZ practitioners
  - What empowers (or inhibits) TRIZ practitioners
  - What TRIZ tools are best utilized by TRIZ practitioners
  - General suggestions for TRIZ utilization
- Survey response – 165 responders
  - 27 - 40 Principals Work Shop Trainees (this data was not used in this preliminary analysis)
  - 73 – L1 Trainees
  - 34 – L2 Trainees
  - 32 – L3 Trainees




# Analysis Background

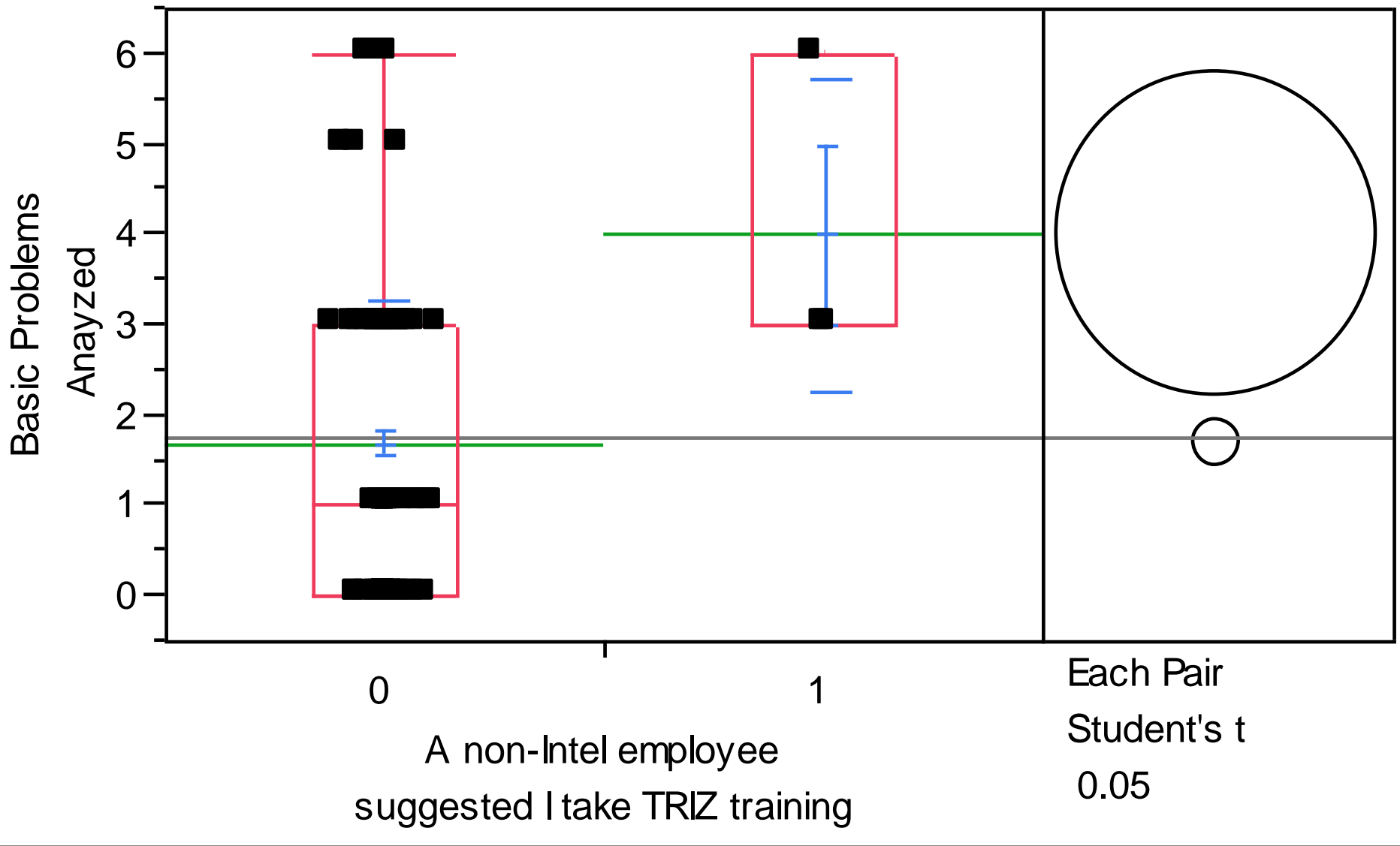
- We identified 16 data inquires for this initial analysis
  - There are 405 possible first level, 2 variant relationships contained in the survey
- Those 16 were chosen as our first guess at what information would be most helpful in understanding how to positively influence the usage of TRIZ with Intel
  - The results of the initial analysis naturally point to other 2 variant scenarios that might provide additional useful information - future data analysis?
- Some analysis results felt inconsequential and are therefore glossed over in this material



# Analysis Results and Potential Responses

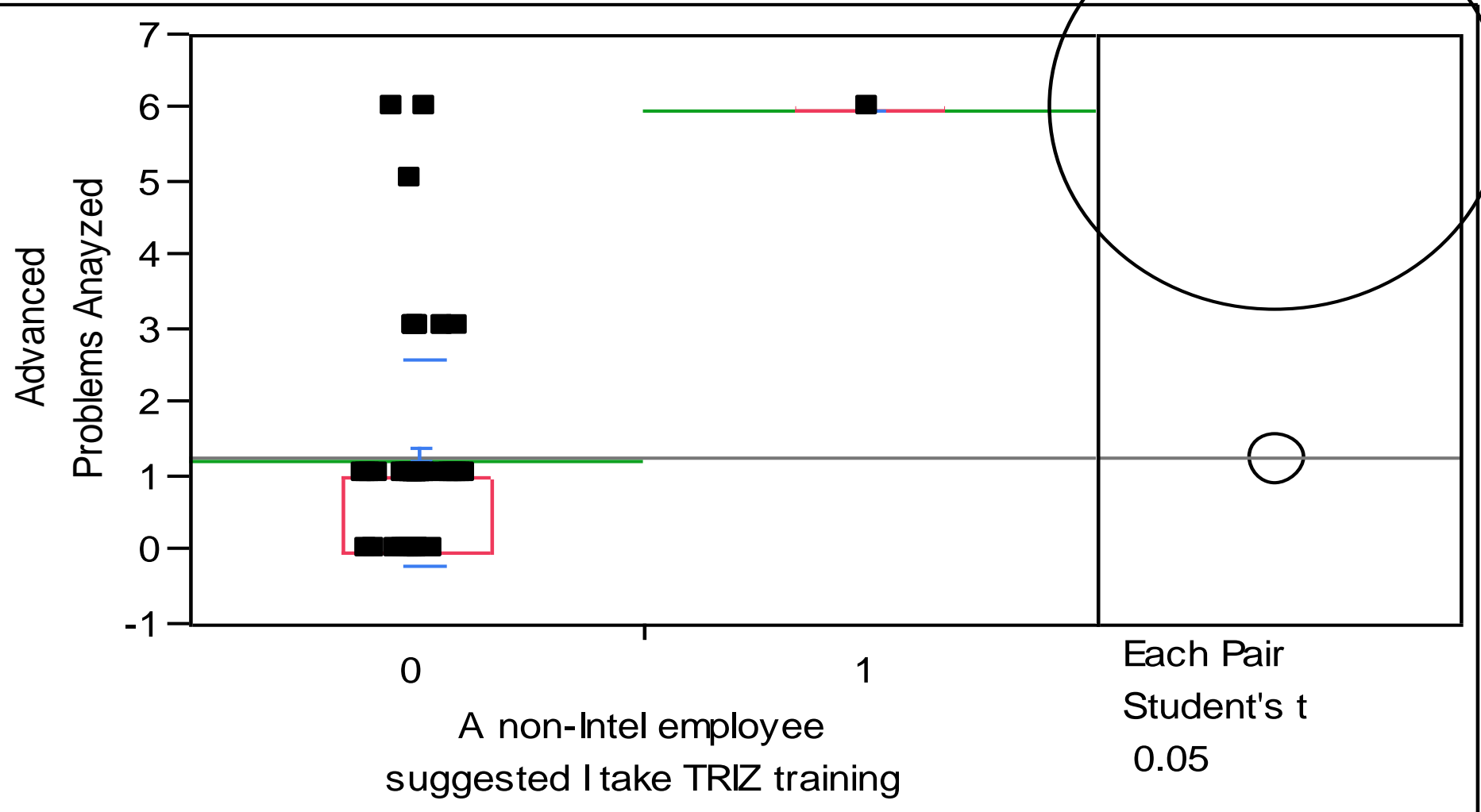
- 
- **Q: Does a certain job function show a higher rate of problem solving after training regardless of training level?**
  - **A: Generally, No. Maybe somewhat higher for Industrial Eng / other for L2 / L1. For L3, job function seems to make very little difference.**
  - **Intel Response – do not pre-judge qualification of potential trainees by their current or past job functions**

- **Q: What reasons for individuals pursuing TRIZ training leads to higher rates of problem solving?**
  
- **A:**
  - Non-intel recommendation for L1 and L2 trainees is statistically significant.
  - For Expert class – People that answered “Other” solved more problems
  - Non-statistical signal for this who were “frustrated with other problem solving techniques”
  
- **Intel Response – Self–selection is probably a good indicator of enthusiastic TRIZ practitioners**

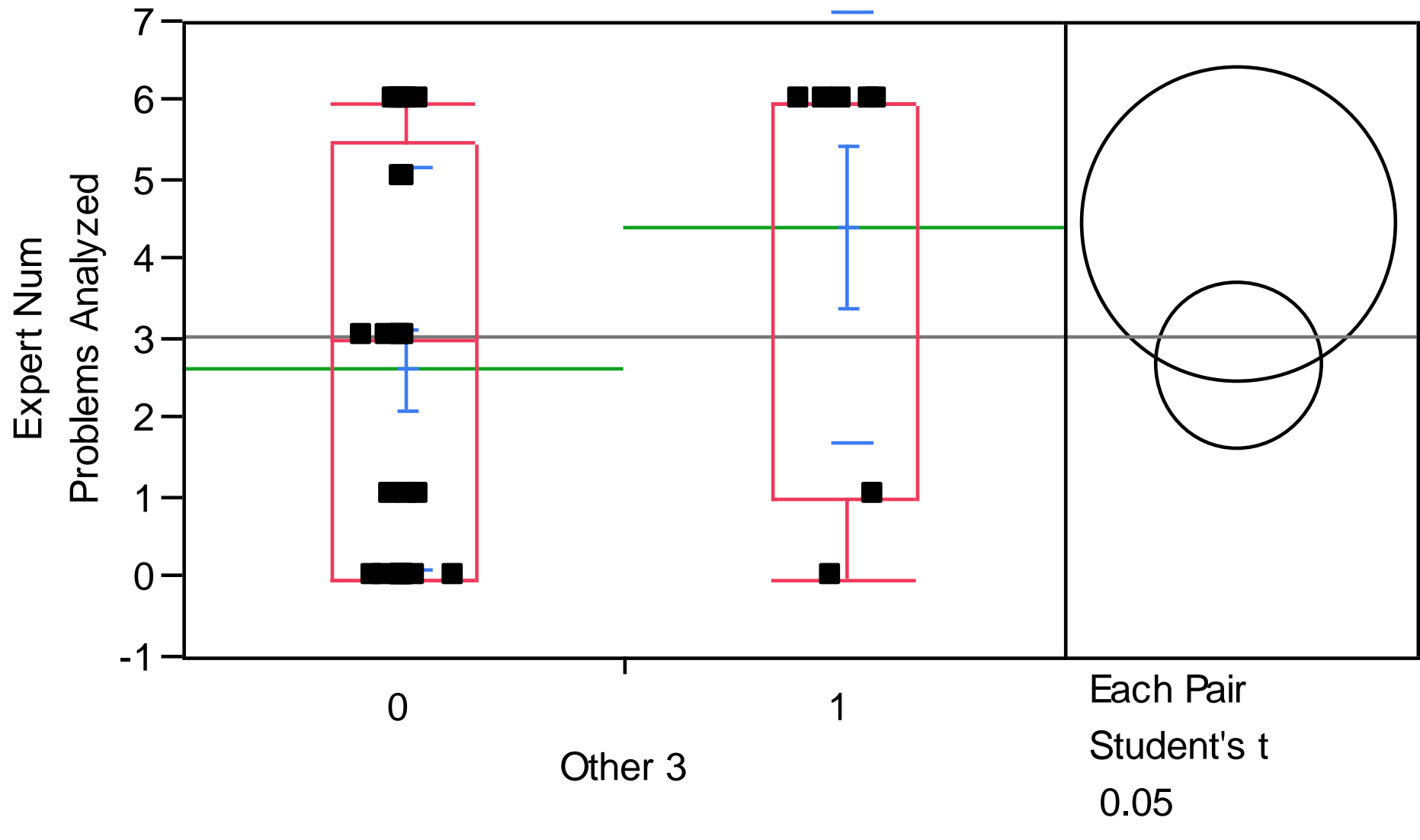


Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
0	128	1.68750	1.57115	0.1389	1.413	1.9623
1	3	4.00000	1.73205	1.0000	-0.303	8.3027

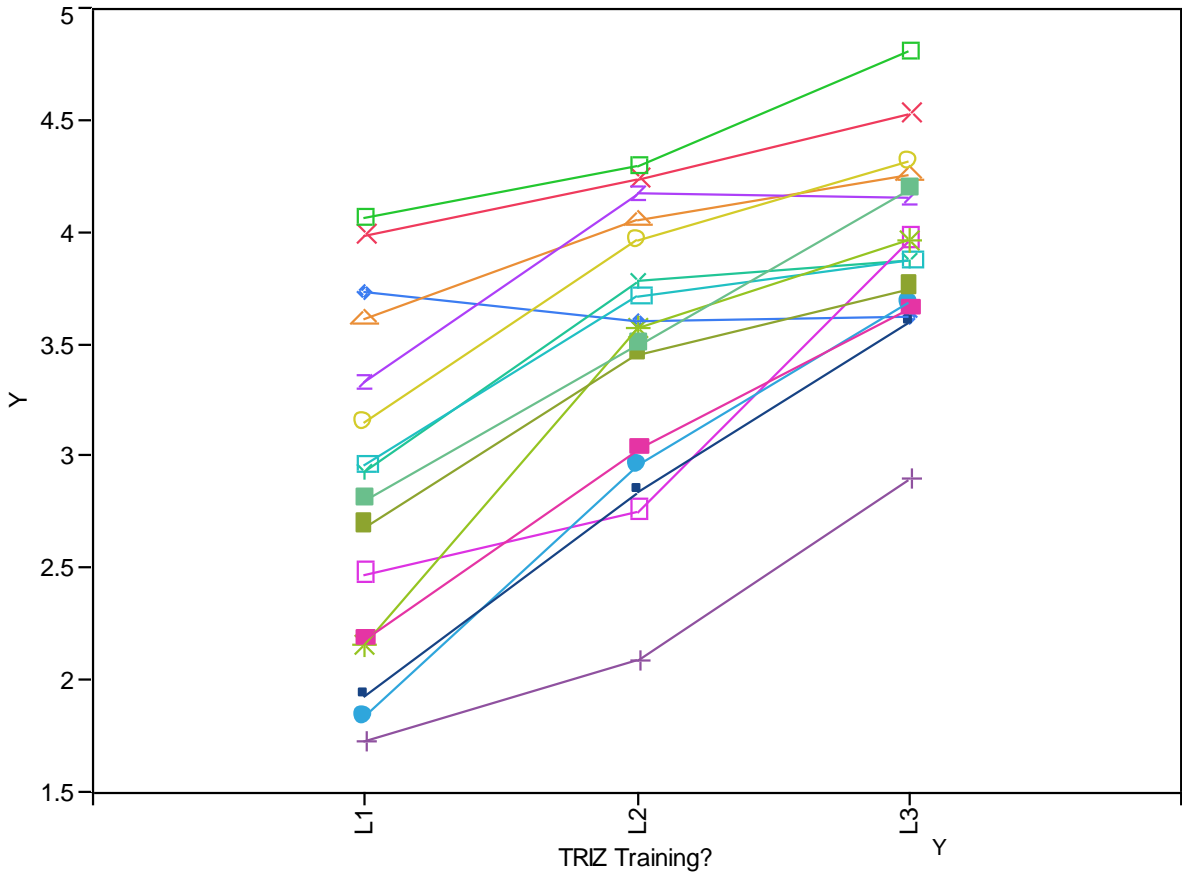





Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
0	62	1.20968	1.39245	0.17684	0.85606	1.5633
1	1	6.00000	.	.	.	.



- Q: How does each level of trainee rate each TRIZ tool's usefulness?
  
- A:
  - Trimming goes down and then flat (L1 to L2 and L2 to L3). Separation goes way up (L1-L3).
  - Primary gain from Basic to Advanced - EC, C Matrix, 40 Principals, PC, Sci Effects, Su-File and Standards, ARIZ, Trends, Flow Analysis, Process Analysis, Feature Transfer
  - Primary gain from Advanced to Expert - Function Analysis, Cause and Effect Chain, Trimming, Sep/Sat/Bypass, Super Effect –
  
- Intel Response – look into Trimming and Physical Contradictions training (these should be stronger after Advanced)

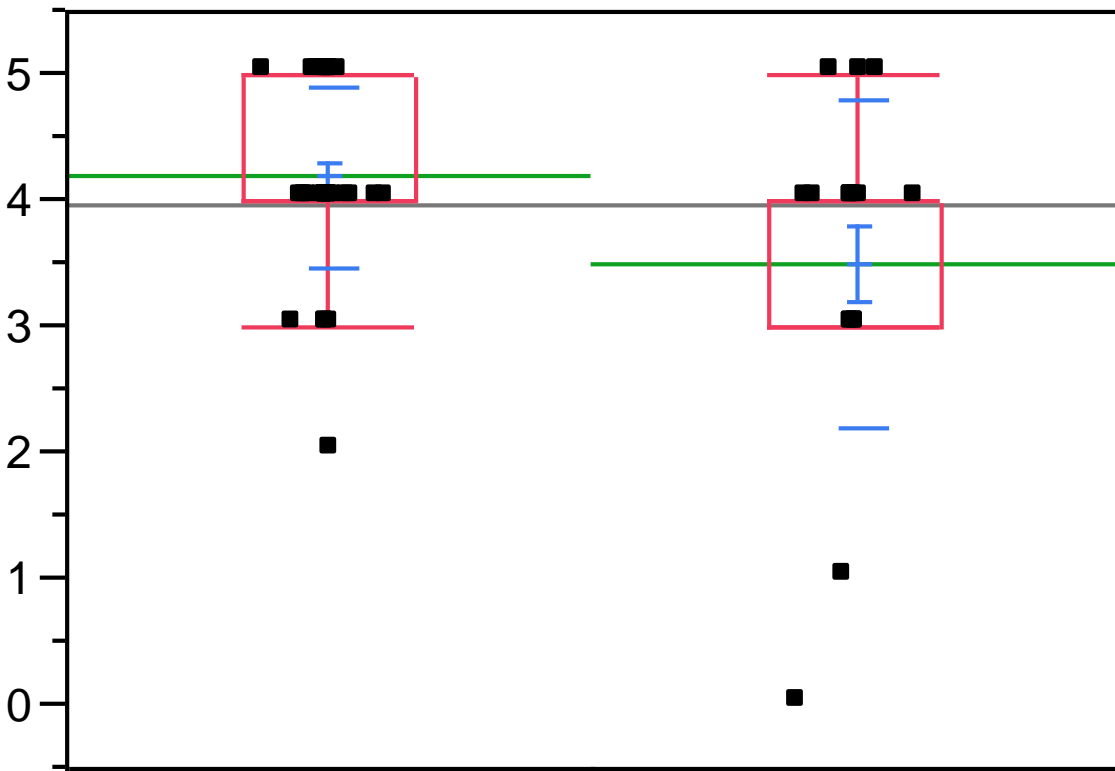


- × — Mean(I effectively utilize Function Analysis)
- — Mean(I effectively utilize the Cause and Effect Chain)
- ◇ — **Mean(I effectively utilize Trimming techniques)**
- △ — Mean(I effectively utilize Engineering Contradictions)
- ∇ — Mean(I effectively utilize Altschuller's Matrix)
- z — Mean(I effectively utilize the 40 Inventive Principles)
- — Mean(I effectively utilize Physical Contradictions)
- — Mean(I effectively utilize Scientific Effects)
- — Mean(I effectively utilize Separation, Satisfaction, Bypass algorithms)
- \* — Mean(I effectively utilize SU-Field Analysis/76 Standard Inventive Solutions)
- — Mean(I effectively utilize ARIZ)
- — Mean(I effectively utilize the Trends or Engineering System Evolution)
- — Mean(I effectively utilize Flow Analysis)
- — Mean(I effectively utilize Process Analysis)
- — Mean(I effectively utilize Feature Transfer)
- + — Mean(I effectively utilize Super Effect)

- 
- Q: How do L1s,L2s,L3s with 0 problems solved rate tools compared to L1s, L2s, L3s with 1 or more problems solved (each group separate)
  - A: For L1s, people that analyzed at least 1 problem gave several tools higher ratings (FA, CEC, contradictions, etc..)
  - Intel Response – Insure that Problem Modeling Tools are well understood after Basic Training



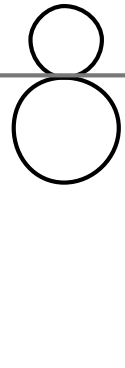
I effectively utilize  
Function Analysis



Analyzed at least  
one problem.

No problems  
Analyzed

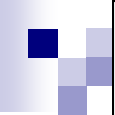
Each Pair  
Student's t  
0.05



Basic

Any Solved

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
Analyzed at least one problem.	41	4.19512	0.71483	0.11164	3.9695	4.4207
No problems Analyzed	18	3.50000	1.29479	0.30518	2.8561	4.1439



I effectively utilize the Cause and Effect Chain

5  
4  
3  
2  
1  
0

Analyzed at least one problem.


No problems Analyzed

Each Pair Student's t 0.05


Any Solved


Basic

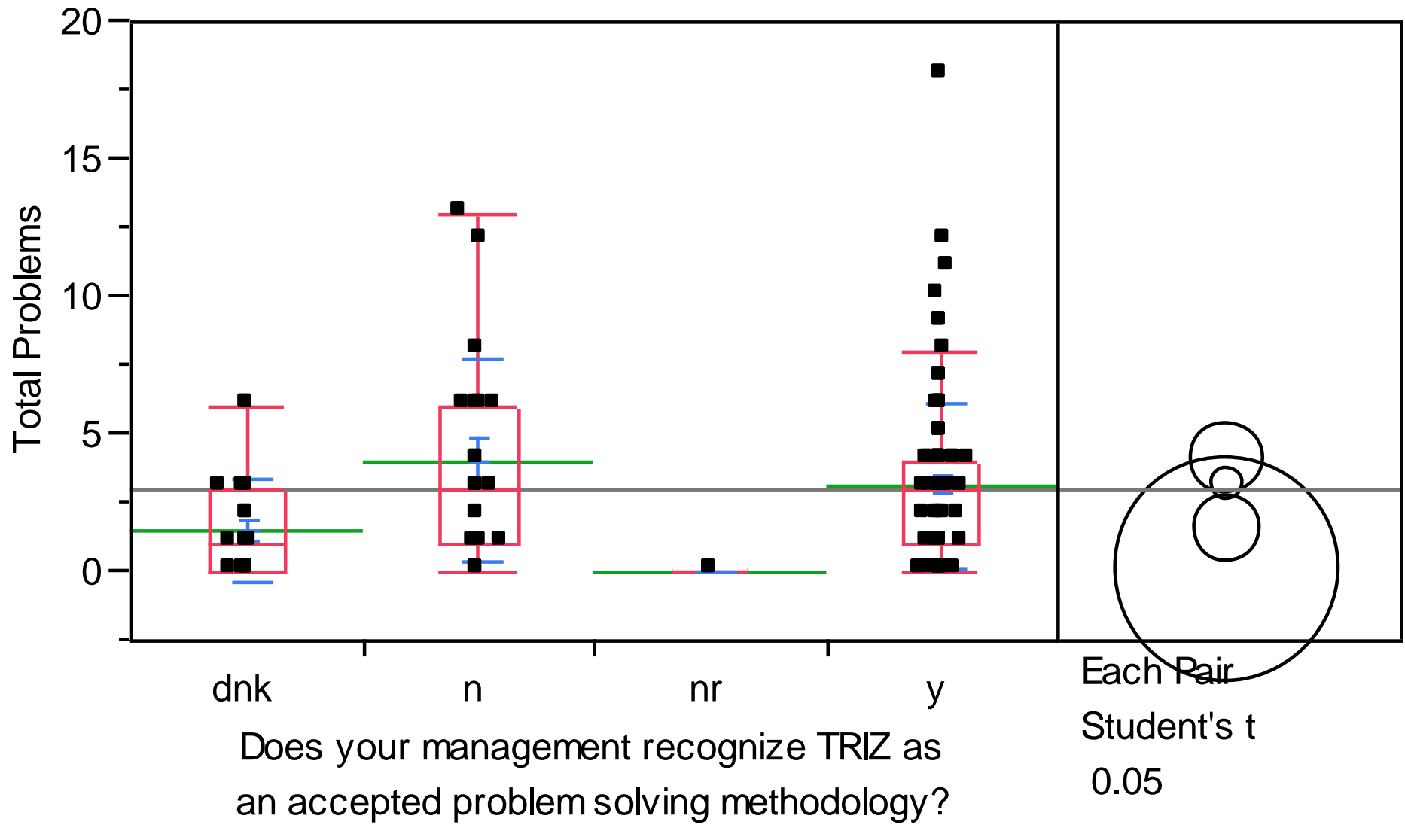
Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
Analyzed at least one problem.	42	4.28571	0.70834	0.10930	4.0650	4.5064
No problems Analyzed	17	3.52941	1.28051	0.31057	2.8710	4.1878

- 
- Q: How do trainees whose sups allow support of other Orgs compare in problem solving rate with trainees whose sups do not support problem solving in other orgs
  - A: Does not seem make a difference
  - Intel Response – Ignore your supervisor's direction?!?



- 
- Q: What are the time with Intel, organization, job function, and training level of people who can name 3 wins?
  - It seems as if the % of people who can name 3 wins is strongly influenced by TRIZ training level, but not by much else.
  - Intel Response – Improve our marketing of TRIZ successes throughout the VF

- 
- Q: How do trainees whose supervisors recognize TRIZ as accepted problem solving methodology compare in problem solving rate with trainees whose sups do not recognize TRIZ as accepted?
  - A: Mostly does not seem to matter, and for L2s, it appears as if NOT having mgmt support leads to more problem solving.
  - Intel Response – Once again, ignore your supervisor's direction?!?




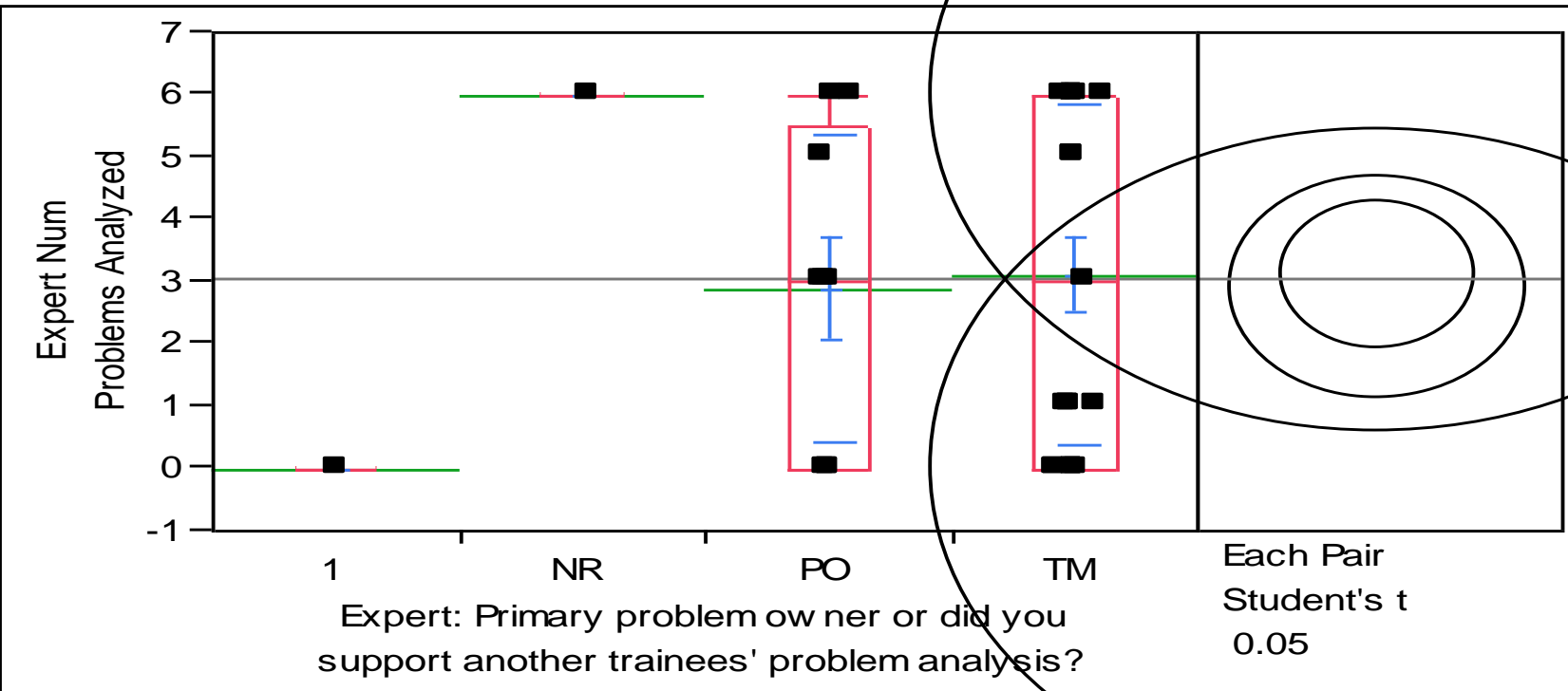
Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
dnk	22	1.50000	1.84520	0.39340	0.6819	2.3181
n	20	4.05000	3.70597	0.82868	2.3156	5.7844
nr	2	0.00000	0.00000	0.00000	0.0000	0.0000
y	95	3.14737	3.02812	0.31068	2.5305	3.7642

- Q: What rate of responders want to meet regularly to improve their skills?
- A: L2/L3 have high rates of wanting meet.
- Intel Response – reestablish and sustain TRIZ working groups and mentoring sessions

TRIZ Training?	N Rows	Mean(Want to Meet)
L1	73	79.41%
L2	34	96.97%
L3	32	96.77%

Org	N Rows	Mean(Want to Meet, L1)	Mean(Want to Meet, L2)	Mean(Want to Meet, L3)
ATM	49	67.86%	100.00%	100.00%
ATTD	4	66.67%	.	100.00%
CS	10	80.00%	100.00%	100.00%
FSM	67	89.66%	90.91%	95.83%
IT	2	100.00%	100.00%	.
Other	7	100.00%	100.00%	.

- 
- Q: How do Problem Owners compare with Team Members in post training problem solving rate?
  - A: Does not seem to make a difference.
  - Intel Response – Self selection seems to be more important than bringing a problem to class




expert

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
1	1	0.00000	.	.	.	.
NR	1	6.00000	.	.	.	.
PO	9	2.88889	2.47207	0.82402	0.9887	4.7891
TM	21	3.09524	2.73687	0.59723	1.8494	4.3410

- Q: What reasons were given for not solving problems after training?
- Across all levels, biggest response was training just ended.


Zero Problems after ..	N	Training was not thorough enough	Training was good but I did not feeling comfortable driving an analysis on my own	My supervisor has not been supportive of the process	There were not any TRIZ consultants available to help me or to ask questions of	The general lack of knowledge about TRIZ in my work group hindered my progress	I did not feel like my class project was very successful	I was not comfortable identifying issues to address with TRIZ	I did not have any time to pursue the project work	My Class project resulted in a good solution but I had difficulty getting it implemented	I do not feel that TRIZ is applicable to the type of problems I need to solve	Competing programs (i.e., Lean, HPM, 6 Sigma, etc.) do not leave time to address issues using TRIZ	My training just recently ended	Other
Basic Class	38	8%	18%	3%	3%	16%	3%	11%	29%	8%	26%	11%	21%	5%
Adv Class	19	0%	32%	5%	0%	5%	5%	11%	58%	0%	5%	11%	21%	5%
Expert Class	10	0%	0%	0%	0%	0%	0%	0%	10%	0%	0%	0%	90%	0%


- 
- Q: What reasons were given for not solving problems after training?
  
  - Intel Response – Understand how to:
    - Show applicability across a wide range of issues and between business and technical issues
    - Show high effectiveness between time to solution and progress towards ideality
    - Get more comfort in utilizing methodology after Advanced (working groups?)

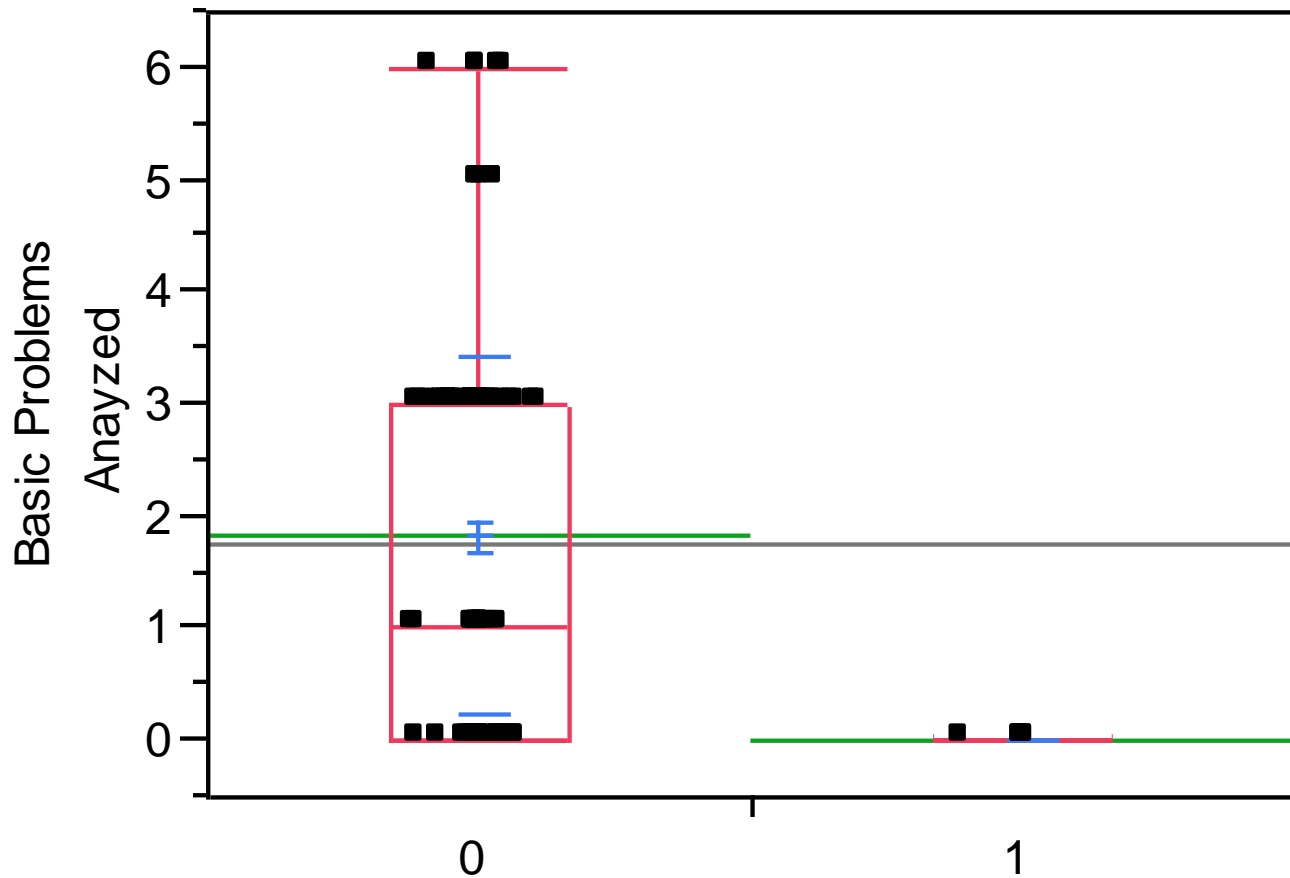


- Q: What reasons were given for solving problems after training?
- A: Training effective was high. More positive answers for L3s.

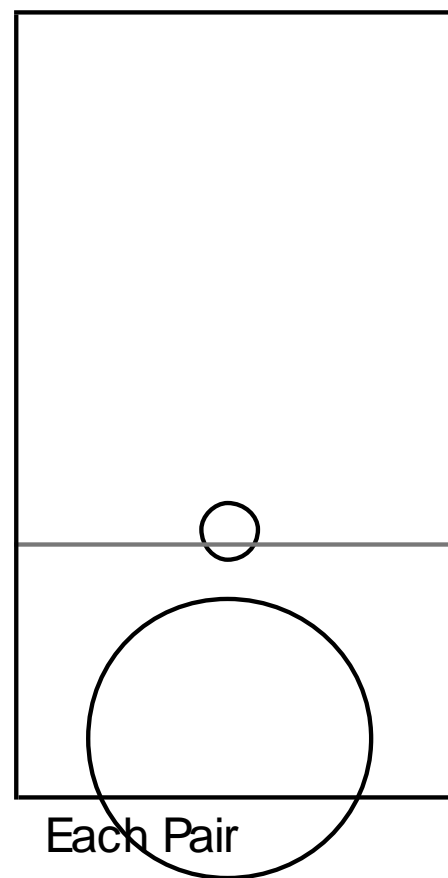
Solved Problems After	N Rows	Training was very effective	I feel comfortable with the tool set - when and how to apply them	My supervisors has been very supportive	Other TRIZ consultant's were supportive of my post training projects	Understating or acceptance of TRIZ in my work group reinforced my efforts	My first project was successful	It was easy to identify other issues that could be addressed with TRIZ	I had extra time to devote to a project	I had limited time to solve an important issue - and therefore used TRIZ	I was energized by the success of my class project	The solution implementation from my first project was effective	TRIZ works well with the type of problems I need to solve	TRIZ integrates very well with other programs (i.e., Lean, HPM, 6 Sigma, etc.) I am supporting	Other
Basic	93	56%	37%	23%	34%	24%	24%	29%	10%	9%	19%	10%	35%	12%	10%
Advanced	45	49%	49%	33%	40%	20%	29%	27%	16%	11%	27%	11%	36%	9%	7%
Expert	23	65%	74%	70%	48%	48%	48%	57%	30%	13%	48%	35%	52%	57%	26%

- 
- Q: What reasons were given for solving problems after training?
  - Intel Response – Understand how to:
    - Improve Management Support
    - Integrate with other Intel programs

- 
- Q: How do trainees who agreed with this statement (lack of knowledge of TRIZ in group) compare to other trainees as far as problem solving run rate?
  - A: There were 6 people who answered that this was an issue, none of them solved any problems after basic. So, it appears that this is a roadblock for using TRIZ
  - Intel Response – Get introductory TRIZ information out across very wide audiences




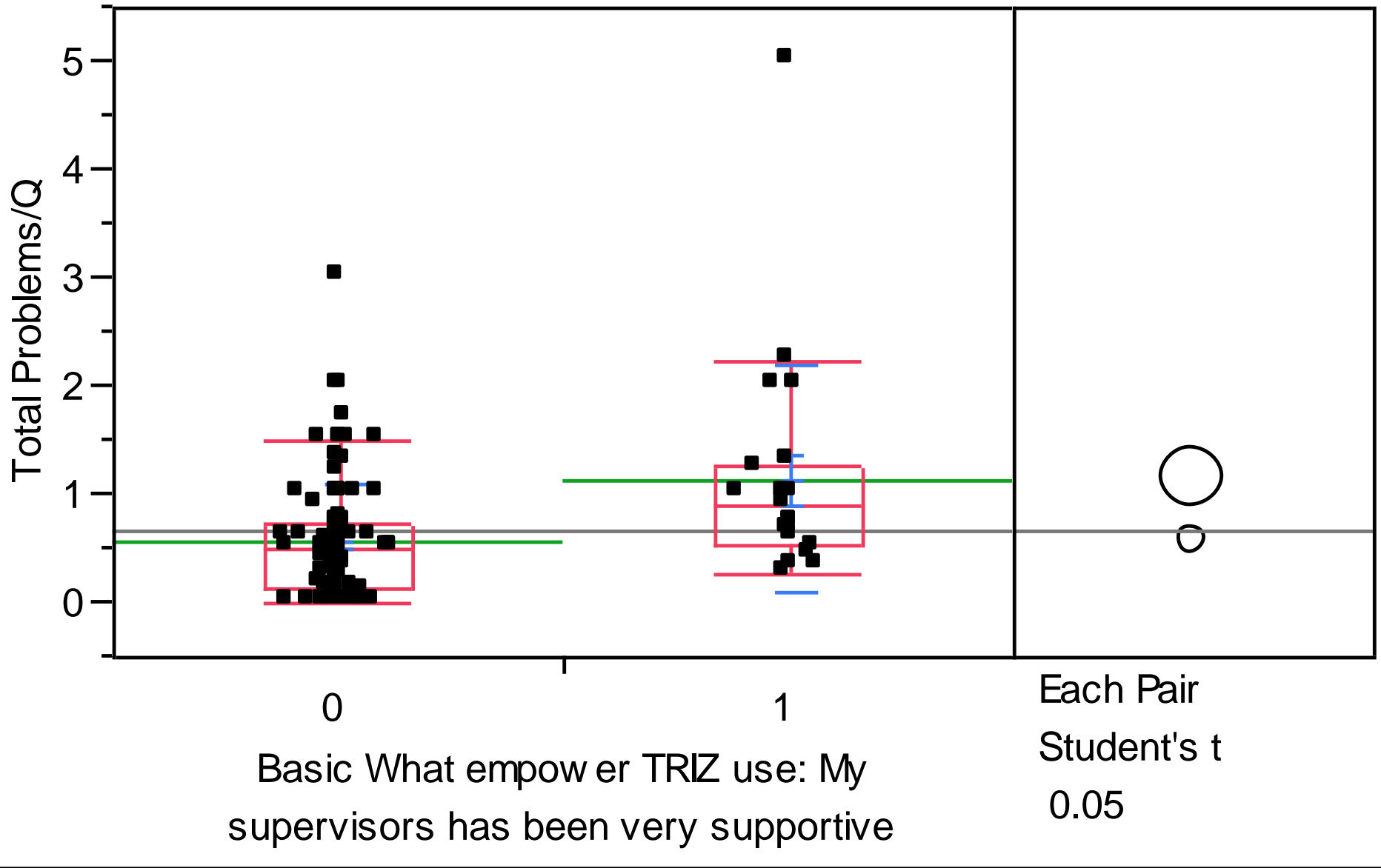
Basic Standing in the way: The general lack of know ledge about TRIZ in my work group hindered my progress



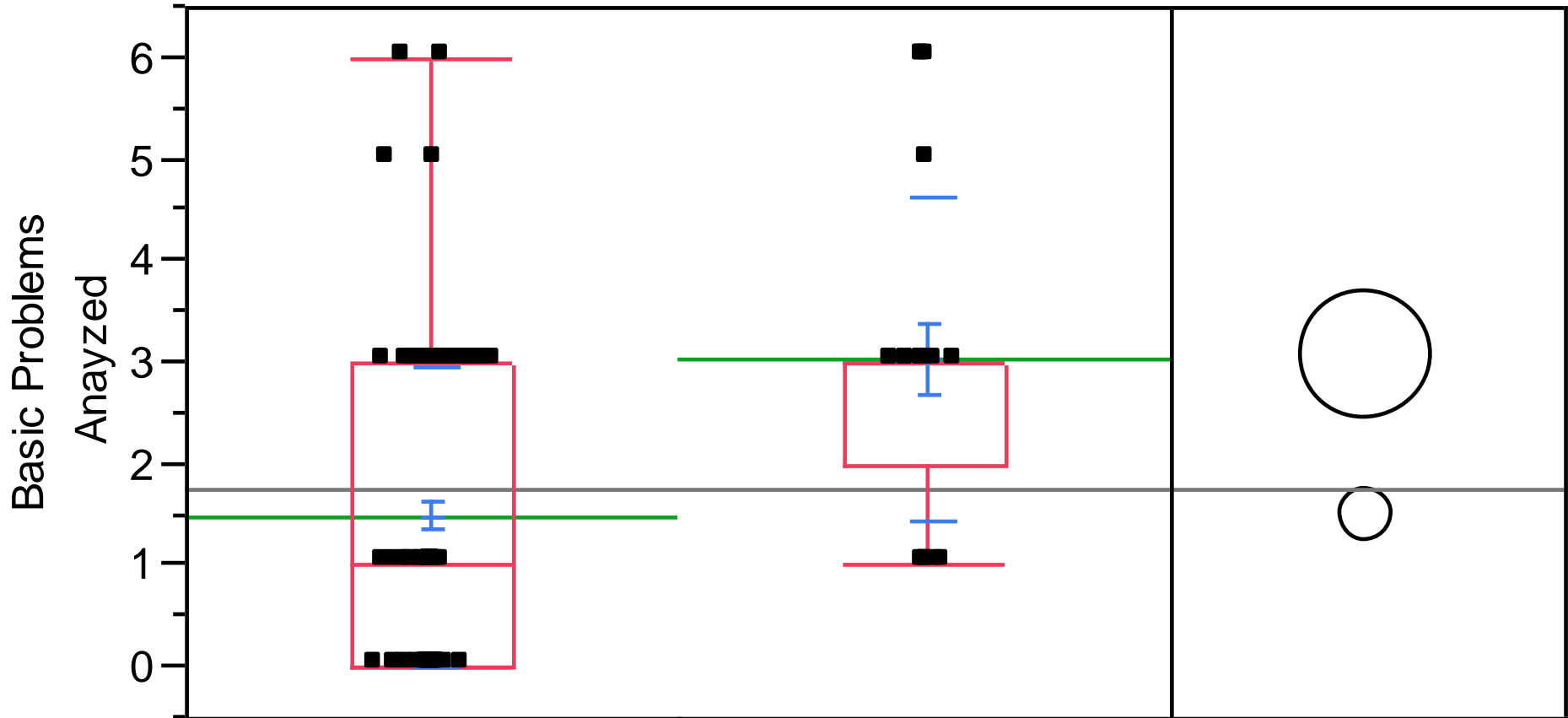
Each Pair  
Student's t  
0.05

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
0	125	1.82400	1.59669	0.14281	1.5413	2.1067
1	6	0.00000	0.00000	0.00000	0.0000	0.0000

- 
- Q: For folks that say that their supervisor supported them, what was problem solving run rate?
  - A: It is statistically higher, for L1/L2 – apparently a key item.
  - Intel Response – get support from and knowledge to management in regards to TRIZ




Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
0	97	0.56546	0.54709	0.05555	0.45520	0.6757
1	21	1.14339	1.04369	0.22775	0.66830	1.6185




0  
 1  
 Basic What empower TRIZ use: My supervisors has been very supportive

Each Pair  
 Student's t  
 0.05

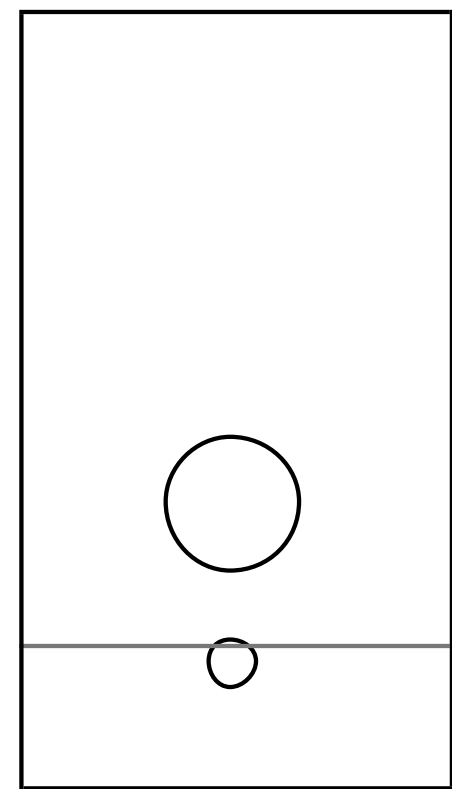
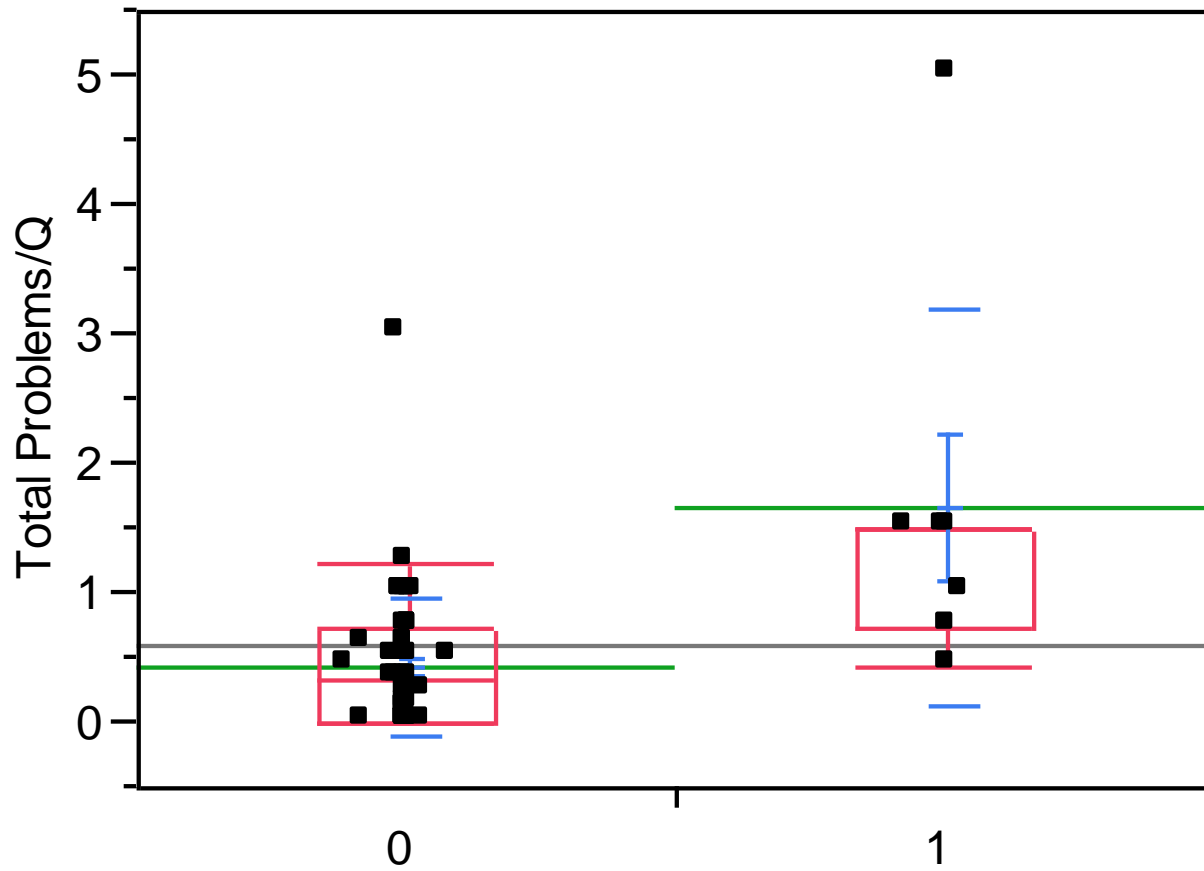
Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
0	110	1.49091	1.48846	0.14192	1.2096	1.7722
1	21	3.04762	1.59613	0.34830	2.3211	3.7742

- 
- Q: How did the answer to “Other TRIZ consultant's were supportive of my post training projects” Affect problem solving?
  - A: A shift for L1 and L3? Not for L2 (it actually makes the problem solving rate slightly worse?) as answered for their basic training.
  - Intel response – establish and sustain mentoring



- 
- Q: How did the answer to “Understating or acceptance of TRIZ in my work group reinforced my efforts” affect problem solving?
  - A: It appears to help, especially for L1, but it is not statistically significant.
  - Intel response – general information dissemination about TRIZ to a wide audience

- Q: How did the answer to “TRIZ integrates very well with other programs (i.e., Lean, HPM, 6 Sigma, etc.) I am supporting” affect problem solving?
- A: There were a fairly low number of positive responses, but it seemed to have a big impact at L1. We should really focus on integrating TRIZ into other methodologies. (possible reason – do these other efforts help provide the big push to get ideas implemented / are these methodologies full of good problems for TRIZ to solve?)
- Intel response – Integrate TRIZ with other Intel programs



Each Pair  
Student's t  
0.05

Basic What empower TRIZ use: TRIZ integrates very well with other programs (i.e., Lean, HPM, 6 Sigma, etc.) I am supporting

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
0	49	0.43126	0.53349	0.07621	0.27802	0.5845
1	7	1.66837	1.52818	0.57760	0.25504	3.0817

# Summary

- TRIZ training is for any self-motivated employee regardless of career profile
- Insure Basic Classes understand Problem Modeling well
- Need to look closely at which tools are focused on and at what training level
- Should improve TRIZ success marketing in VF
- Need trainee mentoring and working groups (reestablished)
- Should establish TRIZ applicability to a wide variety of issues
- Address perception that TRIZ is too slow by showing time to solution vs. ideality
- Work for wide management support
- Integrate TRIZ with other programs (i.e., Lean)
- Introduce the concepts of TRIZ to a wide audience



# Next Steps

- Use on Sustainability Team to help set objectives and goals
- Use on Lean Integration TRIZ Team to help determine tactics
- Author formal paper (VRL)



# Back-up – Comments Recap



# TRIZ Utilization Survey Comments Capture

David Conley

2/12/08

# Comments Capture

## Methodology

- 407 Comments
- Comments captured exactly as written (utilization survey\_Rev5\_comments.xls) – unless I didn't (rare)
- Comments summarized into general topic areas based on my analysis
- Comments not relevant to question were omitted (i.e., “Do you have any suggestion in so far as how to improve TRIZ training?” – no, the training is great!)
- Comments that were not relevant to the question answered but seem relevant to another question were not captured



# Demographics

- What Organization(s) are you associated with?
- Other please specify

## Summary

- 2 - CPLG
- CQN
- 4 - DEG
- Legal/FPG
- 5 - Materials
- MSG manufacturing systems group
- Sort
- 3 - TMG

- What job functions best describes your role as an Individual Contributor, Group Leader, or Manager?
- Other please specify

## Summary

- application developer
- audit manager
- 3 - innovation roles
- defect reduction TL
- ESD engineer
- 2 - integration
- Manager
- NP1
- 3 - Q&R
- Supply Mngt
- 2 - Tech Training
- test development
- Validation Engineer
- 7 - Yield

# General Comments

- Do you have any suggestions in so far as how to improve TRIZ training?
  - More Classes / More Training / More Time (10 comments)
  - Need Management Support (5 comments)
  - Break Classes into smaller pieces or shorten (22 comments)
  
  - Use more, more challenging, or Intel specific solution examples (21 comments)
  - Mandatory Training (5 comments)
  - Merge w/ Other Programs / Training (5 comments)
  
  - Focus Training on sub-set of tools (8 comments)
  - Change the Training (Other) (31 comments)
  - Post Training or TRIZ Program Activities (14 comments)
    - Follow-up (6 comments)
    - Dedicated TRIZ Practitioners (3 comments)
    - Other (5 comments)
  - Other Comments (12 comments)

# General Comments Cont.

Do you have any suggestions in so far as how to improve the utilization of TRIZ within your organization?

- More Classes / More Training / More Time (10 comments)
- Focus Training on sub-set of tools (8 comments)
- Need Management Support (27 comments)
- Mandatory Training (8 comments)
- Merge w/ Other Programs / Training (11 comments)
- Post Training or TRIZ Program Activities (14 comments)
- Follow-up (7 comments)
- Dedicated TRIZ Practitioners (7 comments)
- Increase Sharing / Advertising (13 comments)
- Teams are in too big of a hurry (2 comments)
- Other Comments (27 comments)

# General Comments Cont.

- What has worked well and should continue to be done in relation to TRIZ programs at Intel?
  - Training/Instructors (31 comments)
  - Management Support (5 comments)
  - Working Groups / mentoring (10 comments)
  - Champions (5 comments)
  - Current Program Push / Exposure (2 comments)
  - Tools (8 comments)
  - Conference (11 comments)
  - Consulting (1 comment)
  - Advertising (4 comments)
  - Application (1 comment)
  - TRIZ Experts (3 comments)
  - Other or Not Applicable (15 comments)