



# “Let's think in Little People's and Person's Worlds!”



A Summer Homework  
by Son and Father with TRIZ **2**

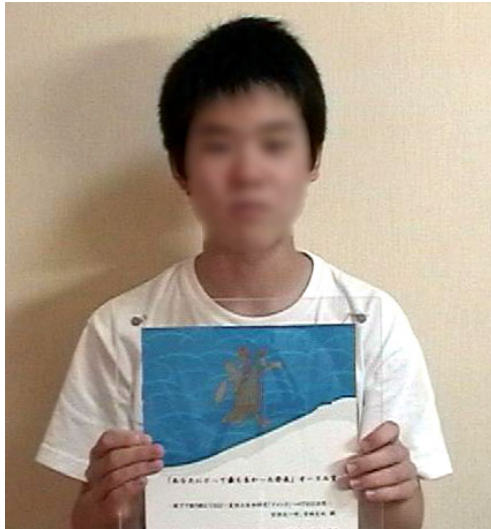
**Kai Miyanishi**

(2nd Grader, Kenroku Junior High School / Son)

○ **Katsuya Miyanishi**  
( / Father)



# We are from KANAZAWA.



**This year!**



**Greeting of reward from eldest son, TAICHIRO.**

1st place of Presentation Award  
@4th TRIZ Symposium in Japan, 2008



**Self introduction from younger son, KAI.**

Intro.

Plan

Person's Worlds  
○○○○

Magnetic Worlds  
○○○○

Experi- Appli-  
ment cation

End



# Background.

Intro.  
Plan  
Person's Worlds  
Magnetic Worlds  
Experience  
Application  
End



## Last summer...

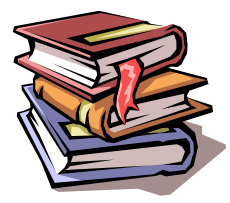
I also want to use TRIZ like my elder brother.



Son

1st Grader,  
Junior High

"One day, a screw that stuck to a magnet was magnetized. How should we do to magnetize the screw? I want to study about it as my summer homework."



"It is interesting!  
The personification might be able to be used.  
Let's try together!"



Father



# Purpose.

**“How should we do to magnetize the screw?”**



- What experiment do we have to do?**
- Let's guess the conditions necessary for the magnetization.**

Intro.

Plan

Person's Worlds  
OOOO

Magnetic Worlds  
OOOO

Experi-  
ment Appli-  
cation

End



# Approach.

- Intro.
- Plan**
- Person's Worlds  
OOOO
- Magnetic Worlds  
OOOO
- Experiment
- Application
- End



## Let's use TRIZ-thinking in practice.

**T1** **Prior analysis** **Preparation**

**Let's think in Little People's and Person's Worlds!**

**The parameters of the experiment are decided.**

**T2** **Confirmatory Experiment** **Verification**

Understanding of phenomenon

**T3** **Post Analysis** **Application**

**New Paradigm**



# Approach.

## Let's use TRIZ-thinking in practice.

Intro.  
 Plan  
 Person's Worlds  
 ○○○○  
 Magnetic Worlds  
 ○○○○  
 Experiment  
 Application  
 End

**Decide the experimental parameters**

**T1**  
**Prior analysis**

**Paraphrase to an easy word**

**Think in Little People's and Person's Worlds!**

**Return to the Magnetic World!**

**Think about the Influence by each Parameter!**

- Abstraction of problem
- Scene deployment
- SLP(Smart Little People)
- Personification
- T1:T2:T3  
(Analysis at time-domain)

- Affinity diagramming
- SFR (Substance Field Resource)

**T2 Verification**

**Confirmatory Experiment**

**T3 Post Analysis**

**Creating original ideas**

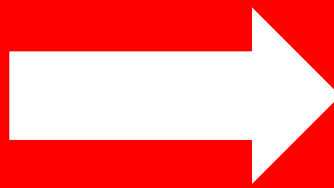
- Attribute Listing
- Punch Pictures



# Approach.

## Let's think in Little People's and Person's Worlds!

**Event**  
in Little People's  
and Person's  
Worlds.



**Solution**  
in Little People's  
and Person's  
Worlds.

**Personification**

Abstraction of  
Problem.

Technical problem.

Return to  
Technical Solution.

Extraction of key word.

Decision of  
Experimental Conditions.



Intro.

Plan

Person's Worlds  
OOOO

Magnetic Worlds  
OOOO

Experi-  
ment Appli-  
cation

End



# Management. (Purpose, Target, Output, Schedule)

## Overview of Goal, Outputs and Schedule.

Intro.  
Plan  
Person's Worlds  
Magnetic Worlds  
Experiment  
Application  
End

### Purpose

About the magnetization

磁石に興味を持って聞くと、それだけ長い間、鉄は磁石になるのか?

長い間磁石にするには、なにが通しているのか? (これは材料が)

長い間磁石にするには、他にどんな条件があるのか?

磁石の材料には何が通しているのか?

磁石の材料はなに? 材料はなにに使っているのか?

磁石と永久磁石は戻る角度が異なるのか?、以外になにが通っているのか?

このEPOの時間、磁石についておぼつかない永久磁石になるのか?

磁石は作れるのか?

### Pre-audit

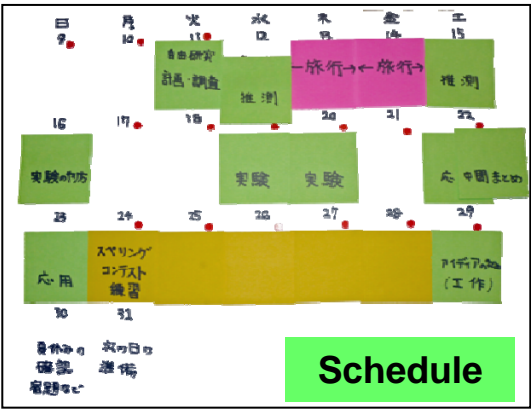
「磁化」の言葉の意味を調べる!!

### Applications

磁石磁化の特徴を具体的に整理する。

強い磁石と弱い磁石で使い方が違うのか? それぞれの使いかた?

永久磁石と磁石は使い方が違うのか?



### Experiments

どんな実験をすれば、推測が当たっているかを確認できるか?

必要な材料を揃える。

実験して確認する。

思い通りにいかなかった場合、その原因を考えて改良する。

磁石や磁化を使ってどんなことが出来るのか?

動詞、形容詞、名詞で磁石の事を考えよう。

### Ideas

ユニークなアイデアを速く、手軽に作る物。

実用的な物

### Image of Outputs

レポート 30枚 A4レポート

リングファイルにとじる

レポート用紙 手書き 鉛筆で

絵や写真をたくさん付ける。

### Guess of mechanism

「磁化」の仕組みを推測する!!

磁化の世界を人の世界に置き替えて考えてみる。

人の世界で解決策を考える。

人の世界の解決策を磁化の世界に戻す。

「磁化」に必要な条件を推測する!!

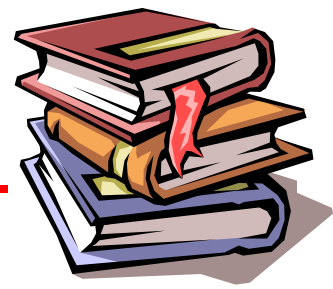
### Impressions





# Abstraction of problem by paraphrase.

## What is magnetization?



We looked up only the "Meaning of the word" in a dictionary.

When the magnetic field is applied from the outside to the material, the phenomenon of the object's wearing magnetism is called a magnetization.

In a word ...



### Paraphrase

**Influenced by working from the outside.**

**(Purpose)**

**Abstraction of problem.**

**Understanding of lucid problem.**

( Details of the principle are not examined. )

磁化

磁場をかけた時に物中に磁気的帯びの現象を磁化という。物理的には磁石としての振る舞いをする。

磁場内の物体が磁気帯びする現象。現象

物体の物質に磁場をかけた時にその物質固有の磁気的帯びが現れる現象。物理的には磁石としての振る舞いをする。

物中に磁気的帯びが磁場を通過させたときに永久磁石と同じように現れる現象。

物質が磁化しただけで物質固有の磁気的帯びが現れる現象。物理的には磁石としての振る舞いをする。

帯磁、着磁  
たいじ、ちやくじ

Intro.

Plan

Person's Worlds  
○○○

Magnetic Worlds  
○○○○

Experiment  
Application

End

# Selection of personification theme.

Influenced by working from the outside.

Little People's World

Person's World



NAZE-NAZE deployment (Root-cause analysis)

4 themes were chosen.



# Let's think in Person's Worlds!

## "T1:T2:T3" deployment were used.




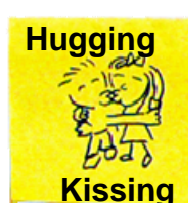





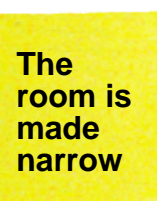





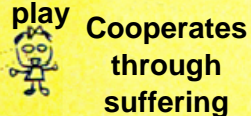

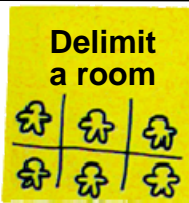





### What do you do? Let's enjoy and imagine!

### Scene-1 Chumming up with Friends

T1:Past

T2:Present

T3:Future

	T 1	Before chumming	T 2	At the time of chumming	T 3	After chumming
		 <b>Solitude Far away</b>	 <b>Handshake</b>	 <b>Hugging</b>	 <b>Cooperate</b>	 <b>Marriage</b>
		 <b>Unrequited love</b>		 <b>Kissing</b>		
		<b>Advance preparation</b>			<b>Backward incidence</b>	
<b>+</b> To Chum More?	 <b>The room is made narrow</b>	 <b>Grandstand play</b>	 <b>Room only of two people</b>	 <b>Always together</b>	 <b>Apologize</b>	 <b>Smile Peaceful</b>
		 <b>Cooperates through suffering</b>			 <b>Money</b>	
<b>!</b> Not to Chum?	 <b>Delimit a room</b>	 <b>Taciturn</b>	 <b>Prohibit by the law.</b>	 <b>Intercepting</b>	 <b>Betray</b>	 <b>Move alone</b>

What's Happened?

Ideas

- Intro.
- Plan
- Person's Worlds
- Magnetic Worlds
- Experiment
- Application
- End

# Let's think in Person's Worlds!



Intro. Plan Person's Worlds 0000 Magnetic Worlds 0000 Experiment Application End

**Scene-2**  
Infection  
of timidity

⊕ To become timid long?  
⊖ Not to become timid anyone

**Scene-3**  
Feel cold  
bathing in  
water

⊕ To become cold long?  
⊖ Not to become cold long?

**Scene-4**  
Influenza  
(Catch a cold)

⊕ To catch a cold long?  
⊖ Not to catch a cold?

T1:Past T2:Present T3:Future

	T1: Past	T2: Present	T3: Future	What's Happen -ed?
What's Happen -ed?				What's Happen -ed?
Ideas				Ideas
What's Happen -ed?				What's Happen -ed?
Ideas				Ideas
What's Happen -ed?				What's Happen -ed?
Ideas				Ideas



# A lot of means gathered.

Intro.  
Plan  
Person's Worlds  
○○○●  
Magnetic Worlds  
○○○○  
Experi-  
ment  
Appli-  
cation  
End



## Increase

The room is made narrow	Grandstand play 	Cooperates through suffering	Room only of two people	Always together 	Apologize 	Smile Peaceful 	Money 	
Weaken physical strength. 	Become Naked Before hand 	Pre-cooling 	Expose oneself to the wind from a fan. 	Keep pouring water. 	Put ice in water. 	Move and Overwork. 	Stay cold and sleep. 	
Go to congested place. 	Gather a timid fellow.	Grumble loudly. 	Go disease zone. 	Be with the sick person. 	Say the impressive grumble.	Concentrate to listen to the grumble.	Keep whining, a long time.	Keep away cheerful companions.

T1:Past

T2:Present

T3:Future



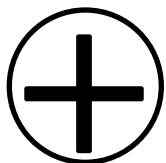
## Decrease

Masking 	Keep away from the sick person 	Wear a lot of clothes beforehand.	Hide oneself in the shelter. 	Open the umbrella, and put on boots. 	Close the exit of water. 	Decrease amount of water. 	Towel, and change clothes. 	Warm oneself at the fire. 	Move and generate heat. 
Bring a pleasant, happy thing.	Banish a timid fellow.	Wash-hands and Gargle.	Take nourishment. 	Intercept the grumble with the earplug. 	Enjoy and forget.	Increase the number of bullish fellows.	Drink the nutritional supplement.	Sleep once, and forget.	
Delimit a room 	Taciturn 	Prohibit by the law. 	Intercept 	Go to Bed	Injection and medicine 	Betray 	Move alone		


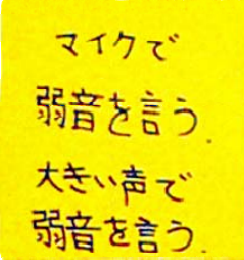
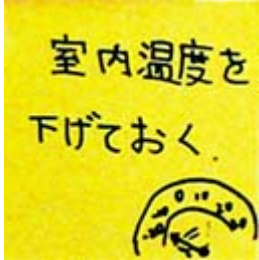
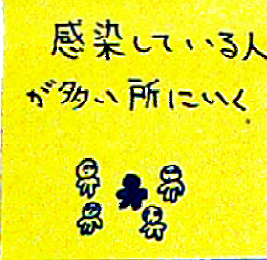


# Return to the Magnetic World!

Return to the world of the magnet with “**(+) measures**”.

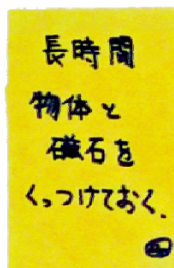


To increase the progress of the state

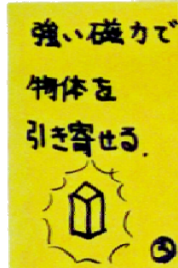
	Chumming	Timidity	Cold by water	Influenza
<b>Person's World</b>	<p>Always together.</p> 	<p>Grumble loudly.</p> 	<p>Pre-cooling.</p> 	<p>Go disease zone.</p> 

**Magnetic World**

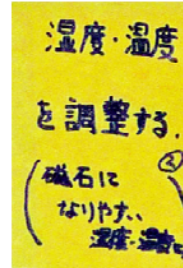
Join it for a long time.



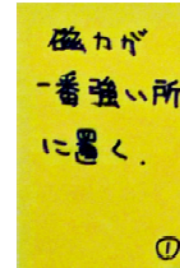
Make magnetism strong.



Adjust the temperature beforehand.



Put it on more influential place.



Intro.

Plan

Person's Worlds  
○○○○

Magnetic Worlds  
●○○○

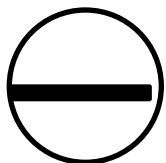
Experi- Appli-  
ment- tion

End


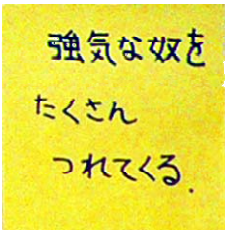
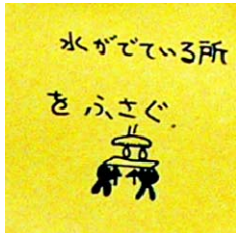



# Return to the Magnetic World!

Return to the world of the magnet with “(⊖) measures”.



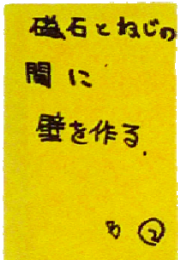
To decrease the progress of the state

	Chumming	Timidity	Cold by water	Influenza
Person's World	<p>Divide the room.</p> <p>部屋を分ける</p> 	<p>Increase the number of bullish fellows.</p> <p>強気な奴をたくさんつれてくる。</p> 	<p>Close the exit of water.</p> <p>水がでていいる所をふさぐ。</p> 	<p>Keep away from the sick person.</p> <p>具合が悪いやつから遠く離れる</p> 

Magnetic World

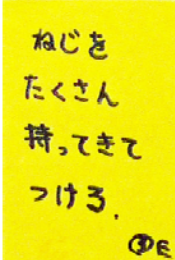
Make the wall.

磁石とねじの間に壁を作る。



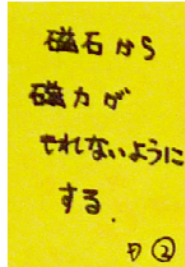
Increase the number of screws.

ねじをたくさん持ってきてつける。



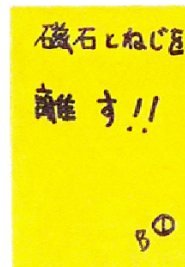
Do not leak magnetism to the outside.

磁石から磁力がでれないようにする。



Keep away the screw from the magnet.

磁石とねじを離す!!



Intro.

Plan

Person's Worlds

Magnetic Worlds

Experim- Appli-

End

○○○○

○○○



# Return to the Magnetic World!

**A lot of interesting ideas, also.**

To increase or decrease the progress of the state

	Chumming	Timidity	Cold by water	Influenza
Person's World	⊖ Betray your partner. 	⊖ Sleep once, and forget. 	⊕ Become naked beforehand. 	⊖ Injection and medicine. 

Magnetic World	<b>Reverse the magnetic pole.</b> 	<b>Pull out magnetism once.</b> 	<b>Peel off paints of the screw.</b> 	<b>Make the antibody in the screw?</b> 
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Intro.

Plan

Person's Worlds ○○○○

Magnetic Worlds ●○○○

Experiment Application

End





# Classify it by "Functioning place".

## Classified by three aspects

SFR (S1: Magnet, S2: Screw, F: Gap)



<b>Magnet</b>	磁力の向きを揃える 	強い磁力で物体を引き寄せる。 	磁力の強弱を安定させる。 	磁石から磁力がおれないようにする。 
<b>Gap Between Magnet and Screw</b>	長時間物体と磁石をくっつけておく。 	磁石と物体の距離を短くする。 	温度・湿度を調整する。 (磁石に近づかない)	磁石とねじを離す!! 
<b>Screw</b>	磁力が一番強い所に置く。 	ねじの塗料を削る。 	磁力を1ヶ所に集中させる。 	ねじをたくさん持ってきてつける。 



Intro.

Plan

Person's Worlds ○○○○

Magnetic Worlds ○●○○

Experiment-Application

End



# Change the group name to "Parameter".

## Subdivide by the affinity diagramming.

Seven groups

**Group name**  
||  
**Experiment parameter**

**Location**

Put it on more influential place.

Concentrate magnetism.

**Obstructive**

Make the wall.

Put the screw in a metallic box.

**Distance**

Keep away and leave the screw from the magnet..

Bring the distance close.

Keep away the screw from the magnet.

**Temperature**

Adjust the temperature with humidity. (best for the magnet.)

Change the environment by using the fire And water.

Hot is better. Cold Hot



# Influence Parameter gives magnetic.

Intro.  
Plan  
Person's Worlds  
○○○○  
Magnetic Worlds  
○○○●  
Experi- Appli-  
ment- Appli-  
cation  
End

To be a magnet for a long time

SFR

Parameter  
(= Group name)

		Parameter	長い間 磁石に するには	磁石に しほいたあ には
S1	Magnet	Power	Stronger	Weaker
	Gap	Time	Longer	Shorter
Distance		Shorten	Lengthen	
Temperature		Higher	Lower	
S2	Screw	Location	Influential	Non-influential
		obstructive	Exist	None
	Screw	Volume	Smaller	Bigger

Not to become a magnet

Pink Tags

⊕ Parameter → strengthen

Blue Tags

⊖ Parameter → Weaken



# Decide the experimental methodology.

Intro.  
Plan  
Person's Worlds  
OOOO  
Magnetic Worlds  
OOO●  
Experi- Appli-  
ment- cation  
End

		To be a magnet for a long time	Not to become a magnet	Experimental methodology	condition	critierion	
S1	Magnet	Power	Stronger	Weaker	Which of a strong or weak magnet can longer magnetize the screw ?	Compare (strong) 2000(Gauss) (weak) 600(Gauss) Conditions (same) 30(°C) 72(Hour) No-wall	The length of the magnetization is substituted by strength. Number of stucked clips.
		Time	Longer	Shorter	Which of a long or short period can longer magnetize the screw? (Same magnetism)	Compare (long) 72(Hour) (short) 3(Hour) Conditions (same) 600(Gauss) 30(°C) No-wall	
		Distance	Shorten	Lengthen	Which of a long or short distance (of the screw from the magnet) can longer magnetize the screw?	Compare (High) +30(°C) (low) -18(°C) Conditions (same) 600(Gauss) 72(Hour) No-wall	
S2	Gap	Temperature	Higher	Lower	Which of in the sun or refrigerator can longer magnetize the screw?	Compare (High) +30(°C) (low) -18(°C) Conditions (same) 600(Gauss) 72(Hour) No-wall	The magnetic field is searched with the compass.
		Location	Influential	Non-influential	Which of in a powerful or weak magnetic field can longer magnetize the screw?	Compare (Wall) Exist (No-wall) --- Conditions (same) 30(°C) 72(Hour) 600(Gauss)	
		obstructive	Exist	None	Which of with or without a metal-wall can longer magnetize the screw?	Compare (Wall) Exist (No-wall) --- Conditions (same) 30(°C) 72(Hour) 600(Gauss)	
S2	Screw	Volume	Smaller	Bigger	Which of a huge or small screw can be longer magnetized from the magnet?		



# Let's experiment!

## Experiment on decided condition.

Intro.

Plan

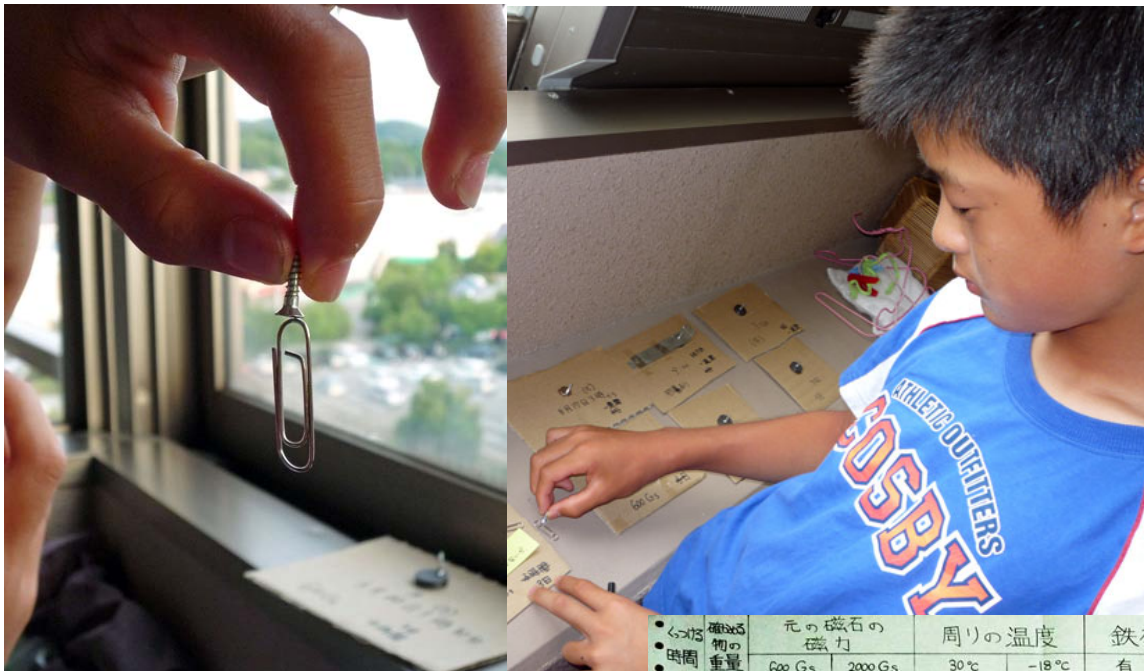
Person's Worlds  
OOOO

Magnetic Worlds  
OOOO

Experiment

Application

End



We had a hard time to find the clear difference.

However, we were able to find the tendency.

Result is important, but thinking beforehand is important, too.

Do not do claptrap.

- 元の磁石の磁力は強い方が良い。
- 周りの温度は低い方が良い。
- 磁石とねじの間の鉄板はあったほうが良い。



確認 時間	元の磁石の 磁力		周りの温度		鉄板有無	
	600Gs	2000Gs	30℃	-18℃	有	無
重 (クリップ)	0	0	0	0	0	0
短 (3日)	×	×	×	×	×	×
軽 (10秒以内)	0	1 (瞬間)	0	1 (瞬間)	1	0
重 (クリップ)	×	0.5	×	ねじ(10cm) 持ち上げ高さ	0.5	×
重 (クリップ)	0	0	0	0	0	0
重 (クリップ)	×	×	×	×	×	×
長 (1週間)	0	0	0	0	0	0
軽 (10秒以内)	×	1	0	1は余裕 2は2秒	0	0
軽 (10秒以内)	×	ねじ(10cm) 持ち上げ高さ	×	2は 5cm	×	×

●実験結果の考察

実験結果の表の中にあるのは、元の磁石の磁力が強い方が、周りの温度が低い方が、磁石とねじの間の鉄板があった方が、浮いた本数が多い傾向がある。また、元の磁石の磁力が強い方が、周りの温度が低い方が、磁石とねじの間の鉄板があった方が、浮いた本数が多い傾向がある。また、元の磁石の磁力が強い方が、周りの温度が低い方が、磁石とねじの間の鉄板があった方が、浮いた本数が多い傾向がある。





# Let's explain a favorite idea!

- Intro.
- Plan
- Person's Worlds  
○○○○
- Magnetic Worlds  
○○○○
- Experiment
- Application
- End

## Short summary by style of patent description.

- 【 Title of the invention 】
- 【 Background of the invention 】
- 【 Brief summary of the invention 】
- 【 Brief description of the several views of the drawing 】

(My invention)

## Magnetic eraser ( Magnetized stationery )

- No cluttering because the rubbish hardens.
- Can be erased well with magnet powder.
- Not lost because it sticks to the pen case.

僕の発明 (My invention)

○ タイトル (Title)  
磁気を帯びた文具「磁石消しゴム」

○ 今までの消しゴムの課題 (Problem of past eraser.)  
消しゴムのカスが机の上にあるのが邪魔で、手で取り除くとしてしまい、教室や部屋が汚くなってしまう。

○ このアイデアの良さ (Merit of my idea.)  
消しゴムのカスが磁気によって固まり、わざわざ下ごしらえなどに乗せなくても、つまむだけで簡単に捨てられる。

○ 図 (Figure)

マグネシウムはくっつくので、持ち運びも楽でなくしていく。

磁気があるため消しカスも固まる

固まった消しカスは本体にくっつけて、さしゴム箱へ!

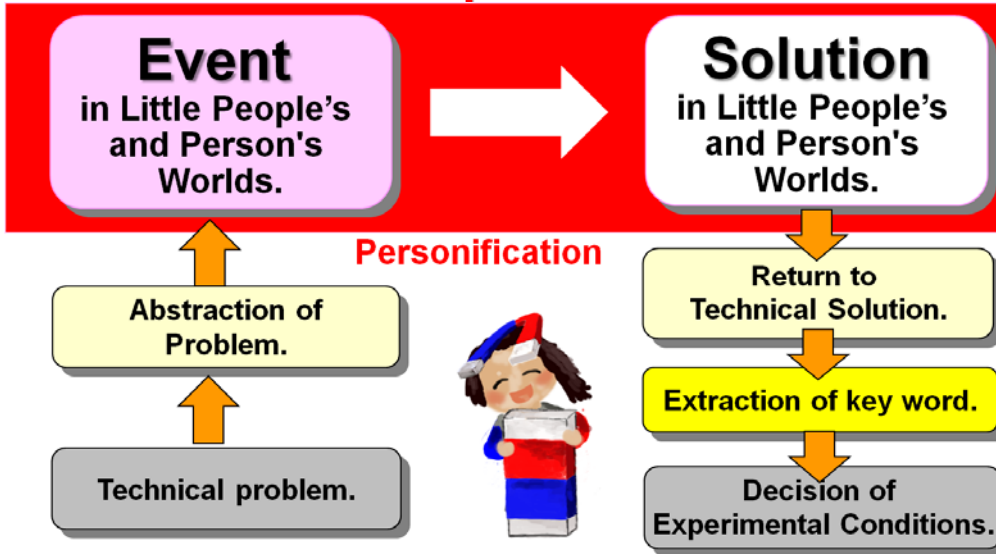
# Summary of study.



## “How should we do to magnetize the screw?”

We requested the hint of this technological problem from different field or daily life. (Little people’s and person's worlds)

Let's think in Little People’s and Person's Worlds!



**Scene-1**  
Chumming up with Friends

	T1: Past	T2: Present	T3: Future
	T 1 Before chumming	T 2 At the time of chumming	T 3 After chumming
	Solitude Far away Unrequited love Advance preparation	Handshake Hugging Kissing	Cooperate Marriage Backward incidence
⊕ To Chum More?	Grandstand play The room is made narrow Cooperates through suffering	Room only of two people Always together	Apologize Smile Peaceful Money
⊖ Not to Chum?	Delimit a room Taciturn	Prohibit by the law Intercepting	Betray Move alone

What's Happened?  
Ideas

	To be a magnet for a long time	Not to become a magnet	Experimental methodology	condition	criterion	
S1 Magnet	Power	Stronger	Weaker	Which of a strong or weak magnet can longer magnetize the screw? Compare (strong 2000Gauss) (weak 600Gauss)	Conditions (strong +200°C) (weak 720hour) (No-wall)	The length of the magnetization is substituted by strength, number of stacked clips
F Gap	Time	Longer	Shorter	Which of a long or short distance (of the screw) can longer magnetize the screw? Compare (long 720hour) (short 30hour)	Conditions (strong +600Gauss) (weak 300°C) (No-wall)	Does magnetism remain in the clip even if it is removed from the magnet?
	Distance	Shorten	Lengthen	Which of a long or short distance (of the screw) can longer magnetize the screw? Compare (long 720hour) (short 30hour)	Conditions (strong +600Gauss) (weak 300°C) (No-wall)	
	Temperature	Higher	Lower	Which of in the sun or refrigerator can longer magnetize the screw? Compare (high +60°C) (low -18°C)	Conditions (strong 600Gauss) (weak 720hour) (No-wall)	
S2 Screw	Location	Influential	Non-influential	Which of in a powerful or weak magnetic field can longer magnetize the screw? Compare (Wall) (No-wall)	Conditions (strong 600Gauss) (weak 720hour) (No-wall)	The magnetic field is searched with the compass.
	obstructive	Exist	None	Which of with or without a metal wall can longer magnetize the screw? Compare (Wall) (No-wall)	Conditions (strong 600Gauss) (weak 720hour) (No-wall)	
	Volume	Smaller	Bigger	Which of a large or small screw can be longer magnetized from the magnet?	Conditions (strong 600Gauss) (weak 720hour) (No-wall)	

The hint exists in a different field or daily life!

Intro.  
Plan  
Person's Worlds  
Magnetic Worlds  
Expert Appli-  
cation  
End





# Son's and Family's comments ··!?

## A lot of suggestions !

Intro.

Plan

Person's Worlds  
○○○○

Magnetic Worlds  
○○○○

Experit

ment Appli

cation  
**End**

A variety of methods will be useful for me.  
In the following research,  
I want to accomplish it by myself.



**Son**

My teacher didn't  
understand my report.  
I was very sad.

This research was  
too hard for me.

On the other hand, I want  
the teacher to listen to  
an unknown methodology  
in sincerity, "What's this?"

**Mother**



Which is father's purpose?  
A solution of the problem?  
Or a brainwash of the  
methodology?

We should reflect for easy  
understanding of our report.  
And, I should have added  
and subtracted  
"volume" and "speed".

**Father**





# This year's vogue ...

Intro.  
Plan  
Person's Worlds  
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cation  
End

## Use by child Flexibility



"Moshi Koukouyakyu no Jyoshi-Manager ga Drucker no "MANAGEMENT" wo Yondara" Natsumi Iwasaki DIAMOND,Inc.



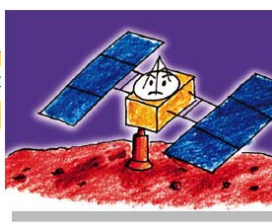
"Karigurashi no Arrietty" Studio Ghibli Hayao Miyazaki, Hiromasa Yonebayashi

## Little People Imagination

"Gendai Moe-Eisei Zukan" Fugen Shikishima SANSAI Books,Inc.

## Personification Intimacy·Empathy

### Asteroid Explorer "HAYABUSA" JAXA



月刊回廊「かくや」



# When acting creatively with the child . .

**Let's use it more flexibly,  
freely and actively.**

- ① Enjoy it together not teaching.
- ② Using the method isn't the purpose.
- ③ Moderate "Volume" and "Speed".  
( Don't be too greedy. Don't work too hard. )
- ④ Continue the motivation of  
"Curiosity" and "Happiness".
- ⑤ Praise and Admitting.



Let's do creative imagination in a different field or daily life!

**Personification and SLP are very useful.**

Intro.

Plan

Person's Worlds  
○○○○

Magnetic Worlds  
○○○○

Expert  
ment Appli  
cation

End