

POGIL in CS II

What, Who, When, Where, How



NSF TUES Type I Project
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 Muhlenberg College, Allentown, PA
<http://cspogil.org>

PAPOGAPIL apin Cape Apes II

Whapat, Whapo, Whapen, Whapere, Hapow



Clapif Kapusmapaul
 Mapuhlapenbaperg Capollapege
 Allapentapown, Pape Apay

What?

- 3 year NSF TUES Type I project
 - develop, validate, & disseminate POGIL activities
 - data structures & algorithms
 - software engineering (project management)
 - foster a POGIL community within CS via talks, workshops, etc.
- also exploring
 - other areas within CS
 - overlapping disciplines, e.g. business, engineering
 - patterns of questions & question types
 - effective uses of technology – e.g. Moodle, video
- <http://cspogil.org>



CS-POGIL
 Process Oriented Guided Inquiry Learning in Computer Science

Log in

Public

Home

project: NSF #044679 (TUES Type I)
 PI: Clif Kussmaul, Muhlenberg College, kussmaul@muhlenberg.edu
 co-PIs: Dan Libby and Carl Sauer, Muhlenberg College
 details: for this project, contact the PI (above); for POGIL in general, visit <http://pogil.org>
 News and Updates
 2012-06 Workshop at Muhlenberg College

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[-] Available Activities

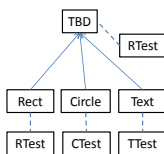
Note: POGIL activities involve students teams working with active facilitation by a trained faculty member. The POGIL Project offers facilitator training workshops.

Activity Name	Contact	Stage	Fund(s)	LastModif	alts
ALG_HASH: Maps & Hash Tables	Clif Kussmaul	3: Refined	PF, Prog Fund	2012-05-25 18:11	
ALG_LIST: Linked Lists	Clif Kussmaul	3: Refined	Java PF, Prog Fund	2012-05-07 09:53	
ALG_QST: Queues & Stacks	Clif Kussmaul	3: Refined	Java PF, Prog Fund	2012-03-02 11:27	
ALG_SORT: Sorting	Clif Kussmaul	3: Refined	Java AL-REG & Comp PF, Prog Fund	2012-03-02 11:27	
ALG_SRCH: Searching	Clif Kussmaul	3: Refined	PF, Prog Fund	2012-03-02 11:27	

A Very Simple CS Model

1. Star duplicate method signatures. (E)
2. Define a new class for these methods. (E)
3. This is an abstract superclass. (I)
4. Refactor to eliminate duplication. (A)
5. Define a unit test suite. (A)

```
public class Rect
{
    /* new */ Rect(Color c,
        int x, int y, int w, int h)
    void draw()
    Color getColor()
    FillPattern getFillPattern()
    int getRight()
    void setLineStyle(Linestyle ls)
    int getWidth()
    int getX()
    int getY()
    void setColor(Color c)
    void setFillPattern(FillPattern fp)
    void setHeight(int h)
    void setLineStyle(Linestyle ls)
    void setWidth(int w)
    void setX(int x)
    void setY(int y)
    String toString()
}
```



```
public class Circle
{
    /* new */ Circle(Color c,
        int x, int y, int r)
    void draw()
    Color getColor()
    FillPattern getFillPattern()
    Linestyle getLineStyle()
    int getRadius()
    int getCircumference()
    int getArea()
    void setColor(Color c)
    void setFillPattern(FillPattern fp)
    void setLineStyle(Linestyle ls)
    void setRadius(int r)
    void setCircumference(int c)
    void setArea(int a)
    void setX(int x)
    void setY(int y)
    String toString()
}
```

```
public class Text
{
    /* new */ Text(Color c,
        int x, int y, String body)
    void draw()
    String getBody()
    Color getColor()
    FillPattern getFillPattern()
    Linestyle getLineStyle()
    int getFont()
    void setBody(String body)
    void setColor(Color c)
    void setFillPattern(FillPattern fp)
    void setLineStyle(Linestyle ls)
    void setFont(int f)
    void setX(int x)
    void setY(int y)
    String toString()
}
```

Intro Activity: Searching

Hi-Lo is a number guessing game for two players – A and B.

A thinks of a number from 1 to 100.

B guesses a number.

A responds with “too high”, “too low”, or “you win”.

B and A continue to guess & respond until B wins (or gives up).

1. Play the game until everyone understands the rules.
2. Describe different guessing strategies that Player B could use. List them in the first column of a table.

Activity: Searching

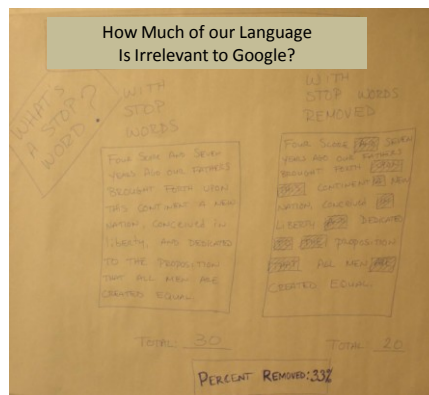
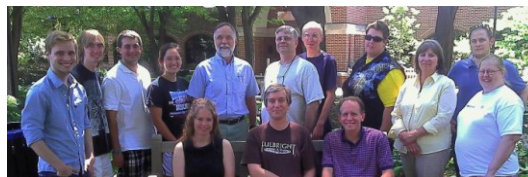
- Evaluate each strategy by how **quickly** it will find the answer, by ranking from 1 (least guesses) to 5 (most guesses). Add the rankings to the table in a column labeled **Quick**.
- Evaluate each strategy by how **easy** it is to describe or specify, by ranking from 1 (easiest) to 5 (hardest). Add the rankings to the table in a column labeled **Easy**.
- In complete sentences, **describe the relationship** between the two sets of rankings.

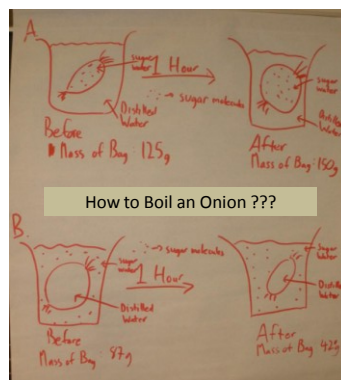
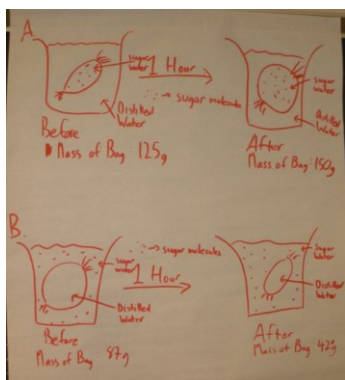
Who?

- co-PIs:** Dan Libby, Carl Salter, Moravian
- faculty:** Muhlenberg, Chestnut Hill, Haverford, Moravian, Nassau CC, Puget Sound, Rose-Hulman, Western New England, Westminster
- students:** Muhlenberg, Haverford, Moravian, Penn
- HS teachers**
- faculty in India:** Int'l Institute of IT – Hyderabad, Amrita U., et al
- other:** literature, math, neuroscience, religion, academic support, library

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- generous (non-\$\$\$) support from POGIL people like you**





When?
(PA = POGIL Activity)

When	PI & co-PIs	CS Collaborators
2011 Summer	plan create & refine PAs	POGIL training review PAs
2011-12	pilot & refine PAs talks	review/pilot PAs evaluate (qual)
2012 Summer	create & refine PAs	POGIL training review/refine PAs
2012-13	refine PAs talks & workshops	evaluate (qual & quant)
2013 Summer	create & refine PAs	create/refine PAs
2013-14	refine PAs talks & workshops	evaluate (quant) pilot/refine PAs

Where?

- ACM Special Interest Group in CS Education (SIGCSE): *Raleigh*
– tutorial, paper, poster, NSF Showcase
- Consortium for Computing Sciences in Colleges (CCSC): *Juniata, Western New England, Quinnipiac*
- American Society for Engineering Education (ASEE): *San Antonio*
- Computer Science Teachers' Association (CSTA): *Irvine, Philadelphia*
- National Collegiate Inventors & Innovators Alliance (NCIIA): *San Francisco*
- IEEE Technology for Education (T4E): *Hyderabad, India*

How?

	Goal: Enhance...	Assessed using...
Students	Learning outcomes.	Grade distributions. Qualitative assessment of work.
	Affective outcomes.	Existing (e.g. SIR-II TDS), & custom instruments.
	Recruiting & retention.	Majors & course enrollments.
Faculty	Activity quality.	Activity reports, peer reviews, interviews.
	Affective outcomes.	Reflection, interviews.
	Supporting technology.	Activity reports, peer reviews, interviews.
	Talks, papers, workshops.	Activity reports, interviews.
	CS-POGIL community.	Attendance & evaluation forms.

Seeking more advice & connections!

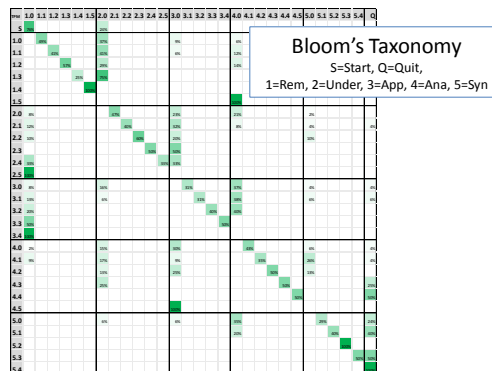
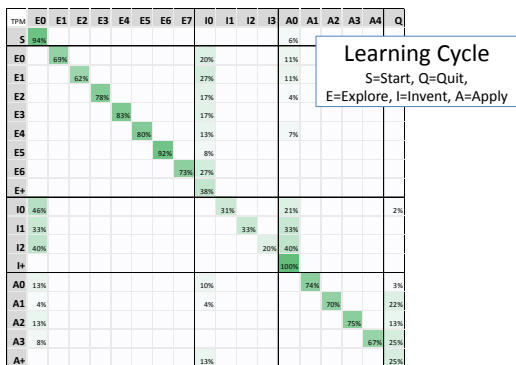
- Clif Kussmaul clif@kussmaul.org
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POGIL Patterns Project with Erica Wenzel '14

- **Patterns** capture effective practices, e.g.
 - “light on two sides of every room”
 - Learning Cycle: Explore, Invent, Apply
 - Team Roles: Manager, Recorder, Speaker
- Analyzed & categorized **358 Qs** in **17 activities**
 - calculus (3), HS chem (5), analytical chem (2), CS (7)
- To explore possible patterns, computed **transition probability matrices (TPMs)** to show prob(type $I \rightarrow$ type J)



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