

# Use of Goal-Setting and Executive Function to Enhance Student Performance

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# Outline

- I: Intro (Goal Setting, Executive Function)
  
  
  
  
  
  
  
  
  
  
- II: FM Examples

# INTRO

- Goal Setting
- Executive Function

# GOAL SETTING means

- *Dividing*

*A Complex Task*

*Into a sequence of*

*Subtasks*

- **EXAMPLES:** *Graphing (Calculus); Advertising Efficacy (Stat 101); Approximating a Bond price from interest rate changes (FM)*

# Good Goalsetting *means*

- On average
- class performance AND satisfaction
- are better

Technique	Avg Grade	Avg Satisfaction
#1	90	60
#2	70	40

# GoalSetting: Good Attributes

SMART	Misc.
<i>Specific #</i>	Clear #
<i>Measurable #</i>	<b>Challenging !!</b>
Attainable	Encourage commitment
Realistic	With Feedback
<b>Timely achievable !!</b>	<b>Complex !!</b>

# Goal Setting Paradox: Challenging<->Achievable Timely

## Group #1 (Stage I,II)

- I: Easy problems

*Good performance*

- -----
- II: Easy, Moderate, Good problems
- *Medium performance*

## Group #2 (Stage I,II)

- I: Difficult problems

*Poor performance*

- -----
- II: Easy, Moderate, Good
- *Superior performance*

# Examples: Different Goal Setting

High Level Description	Instructions to Students
No Goal	Practice throwing darts
Goal Outcome (GO) (grade) – no specificity	Try to achieve high score
Process Outcome (PO)	At each throw do following a) Site Target b) Throwing position c) Follow through (Throw)
PO + Feedback	Feedback after each attempt
Stratified Goals: PO, then, GO	First, focus on <i>a,b,c</i> Then, on “grade”

# Executive Function

- **Old approach:** *Bloom, Anderson, Marzano*
- *Marzano: Analysis → generalize, specify, contrast, classify, match, error detect*
- **My approach:** *Executive Function, multiple modalities*
- **Rule of 4 (Hughes-Hallet, Calculus Reform)**
  - *Verbal*
  - *Graphical*
  - *Formal algebraic*
  - *Computational*

# II: THE EXAMPLES

- I: *Parameter Counting*
- II: *Fellowship approach to pedagogy*
- III: *Familiar; New: as subgoals*
- IV: *Define the “unit” subgoal*
- V: *Executive Function + Goal Setting*
- VI: *HW Tips as Goalsetting*

# I: Counting Parameters

- Sample Problem: *Calculate the probability of a student, using random answering, passing a 3-question multiple-choice test with 3 choices per question, 2 of which are correct*
- *Bin ( $n=3$  questions, 2 correct, 3 choices, at least 2)*
- Last variable *verbal-categorical*: Possible values are {at most  $r$ , at least  $r$ , more than  $r$ , fewer than  $r$ , between  $r$  and  $s$ }

# Counting Parameters: Advanced

- The surprises 😊 😊
- How to implement:
- *One parameter at a time*
- *'Full set of parameters'* HW problems
- Variables: Discrete, continuous, categorical, verbal ← (verbal-algebraic dictionaries)

# II: Pedagogy Fellowship Approach

- Problem (Level 7 ADAPT > FM SOA exam)
- Timeline: 0 \* \* \* 1 \* \* \* 2 \* \* \* 3 \* \* \* 4 \* \* \* 5
- $-P$  970.95 980.44
- Coupon payments 2.5...2.5 C
- Calculate  $i, P, C, r$
- Traditional Approach: Lay out steps, formulae  
← Formulae boring, not challenging
- Goal Setting: Challenging + Achievable timely

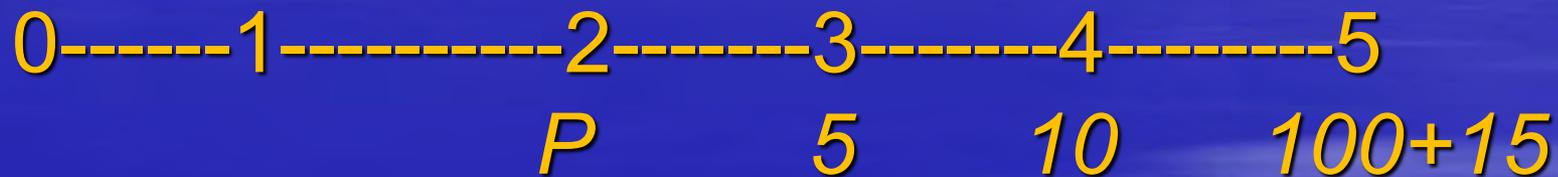
# Fellowship Approach

- Name 4 methods to calculate OLB
- For each method, state pros and cons
- Select appropriate method and solve problem
- -----*Sample Solution* -----

Method Name	Description	When Used
Prospective	PV Future Payments	If you know $n, i$
Retrospective	CV Loan – AV payments	If you know $P, t$
BV-Buy/Sell Method	Buy BV=>Coupons, Sell BV	Don't know $n, P$ ***
Spreadsheet method	$I=i*OLB; R = I+P, OLB-P=>OLB$	Line by line

# III: OLD and NEW as SUBGOALS

- ILLUSTRATIVE PROBLEM: Given a term structure, Calculate  $P$ :



- OLD APPROACH: spot-forward rates in one unit with pricing problems (Too much)
- GOAL SETTING APPROACH: Separate familiar with new (“achievable timely”)

# OLD and NEW as SUBGOALS

- WHAT IS NEW: Complete table (3<sup>rd</sup> row)

$t$	1	2	3	4	5
$r_t$	3%	4%	4.75%	5.25%	5.5%
$P_t = v(t)$	9709	9246	8700	8149	7651

- OLD: 0-----1-----2-----3-----4-----5  
 $P \quad 5 \quad 10 \quad 100+15$
- **OUTFLOW = INFLOW** ← Verbal Goal
- $P v(2) = 5 v(3) + 10 v(4) + 15 v(5) + 100 v(5)$

# IV: Define Subgoals

- Illustrative Problem: Calculate  $L$
- 0---1-----2-----3-----4-----5-----6-----7
- -L 10 10 10 10 15 15 15
- 1.5% 1.5% 1% 1% 1% 2% 2%
- Subgoal approach by defining criteria
- *Breakup problem into units such that each unit is governed by one formula (e.g. 1 rate, 1 payment type, 1 money growth method)*

# Sugoals using Definition/Criteria

- Illustrative Solution: (TL = Timeline)
- 0---1-----2-----3-----4-----5-----6-----7
- -L    10      10      10      10      15      15      15
- 1.5%   1.5%   1%      1%      1%      2%      2%
- TL<sub>1</sub>   TL<sub>1</sub>   TL<sub>2</sub>   TL<sub>2</sub>   TL<sub>3</sub>   TL<sub>4</sub>   TL<sub>4</sub>
- EOV: $L = PV_1 + v^2 PV_2 + v^2 v^2 PV_3 + v^2 v^3 PV_4$
- Homework tips: Give: i) Difficult HW problem, ii) Subgoal definition, iii) Students set goals

# V: Executive Function+Subgoals

## ■ REVIEW

Executive Function: Use different modalities

■ Rule of four: *formal, verbal, graph, calculator*

## ■ IDEA:

■ Easy in one modality; harder in other

■ Illustrate: TV line vs. EOY for refinancing

■ Can you *think of* TV lines as primary description

# Executive Function+Subgoals

- Sample questions in Interest Theory: #75
- $0..|..|..|..1.|.|.|.2.|.|.|.3 \dots 15 \quad (9\%/12=i)$
- $-4 \text{ RRRRRRRRRR} \dots \text{RRRRRRRRRR} \dots \text{RR}$
- $(j/12) \quad S \dots SS; \quad S = R - .0040988$

N	I	PV	PMT	FV	Coents
15*12	9/12	-4	CPT	0	Original Loan
12*12	Keep	CPT	Keep	Keep	OLB <sub>36</sub>
Keep	CPT	Keep	Last row – 0.0040988	Keep	Refinanced loan

# VI: HW Tips using Subgoals

- IDEA: Give a very hard HW problem
- Give tips = Subgoals to be reached
- Illustration Using Reinvestment Problems
- Reinvestment *intrinsically* requires goalsetting
- *Subgoals: Identify each subproblem with 1 rate*
- *For all problems classify: terminal outflow; terminal inflow; intermediate inflow*
- *Key idea: Create summary line all in/out flows*

# HW Tips Using Subgoals

- Illustrative Problem

- TL: 0----1----2----3----4----5---6---7---8---9---10

- TL1: -P    10   10   10   10..     $i = 4.5\%$     1000

- TL2:        5    5    5    5...     $i = 5\%$         5

- *Summary Timeline:*

- -P    5    5    5    5 ...i.....1000+AV2(10)

- EOV:  $P = 5 a_{10|i} + [1000+AV2(10)]v^{10}$