Problem-based Learning with Constructive Alignment

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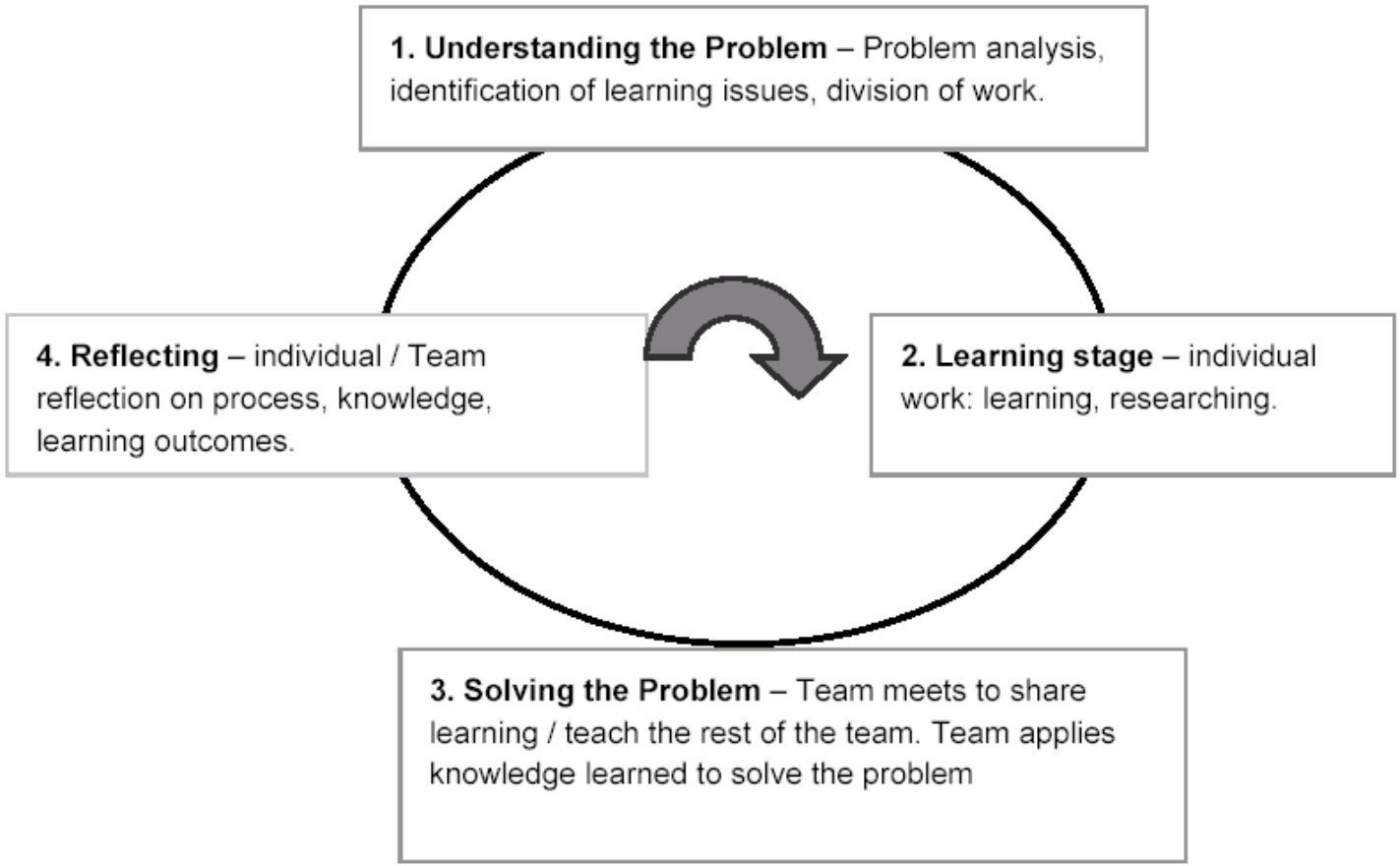
Outline of the Talk

- What is problem-based learning (PBL)
- New teaching and learning activities in *ISMT 111 Business Statistics* and *ISMT 352 Statistics for Financial Risk Management*
- Emphasizing conceptual questions
- Evaluating students using the Study Process Questionnaire (SPQ)
- Difficulties in implementing PBL

Problem-Based Learning

- Problems related to real-life scenarios
- Students have to search for suitable materials (other than lecture notes or standard references) to solve the problem
- Team works
- Learn new knowledge via discussion and sharing

PBL Learning Cycle

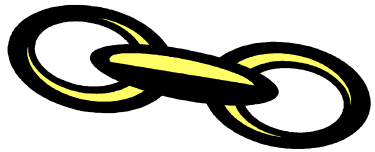


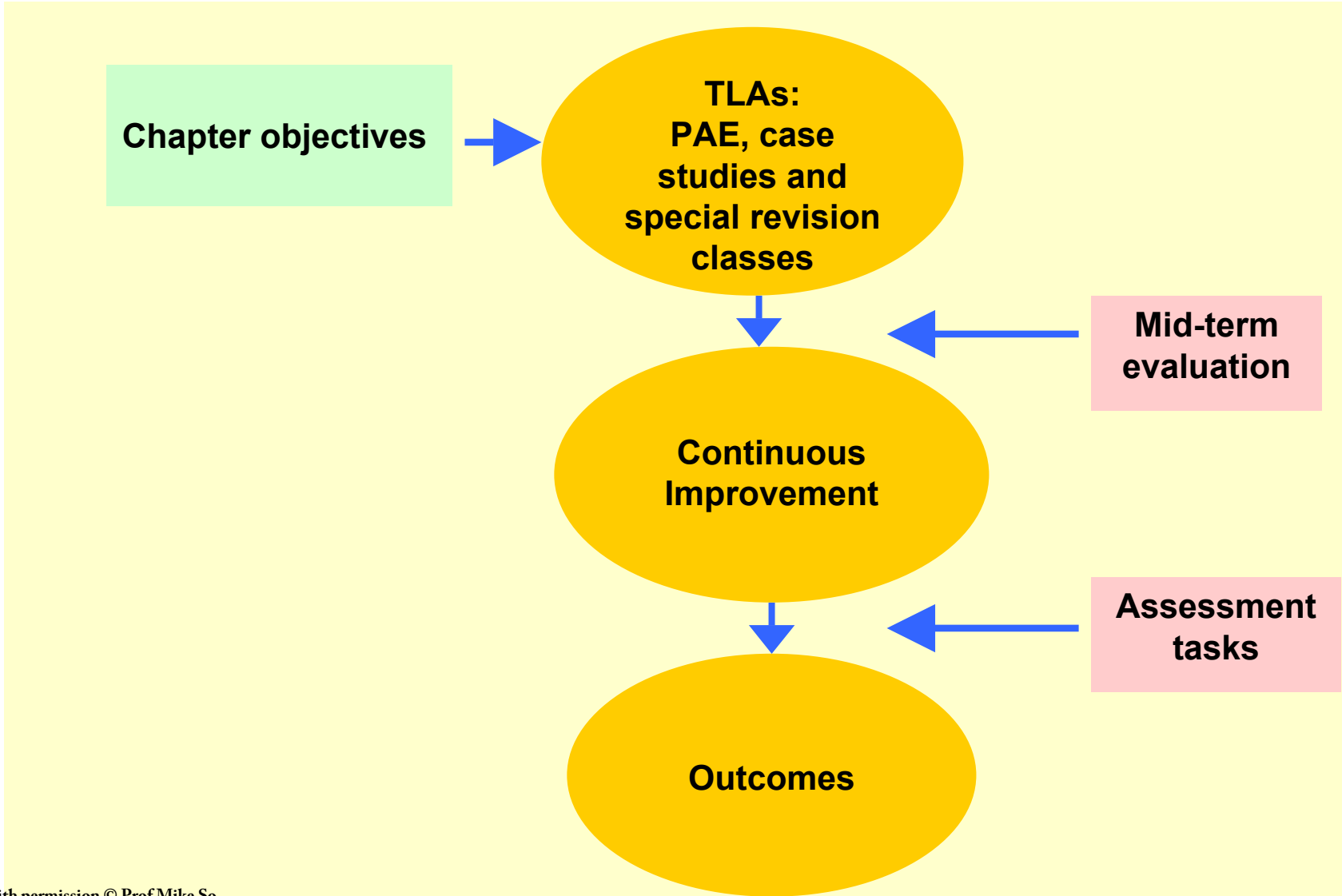
Source: Chris Beaumont & Billy Frank "Enhancing Employability through Problem-based Learning" Edge Hill College of Higher Education.

Advantages of PBL

- Help students to link up concepts and practice and to engage in deep learning approaches
- Produce an active and interactive environment for teaching and learning
- Enhance creativity and collaboration among students
- Build up confidence in the subject
- Improve students' thinking skills

Constructive Alignment





Problem-based TLAs in ISMT 111

- Peer assessment exercises
- Real-life case studies
- Special revision classes which help them analyze conceptual questions

Case 5: (Numerical Descriptive Measures)

The following newspaper cuttings were obtained from The Sun newspaper on July 1, 2004 and Mingpao newspaper on July 29, 2005 respectively. They are about Hong Kong population figures, median age, average life span, ratio of above 65, male to female ratios, median age of marriage, etc.

香港人口統計

		2003 年	2033 年
人口		680 萬	838 萬
年齡中位數		38.0 歲	48.5 歲
平均壽命	男	78.6 歲	82.5 歲
	女	84.3 歲	88.0 歲
逾65歲比率		11.7%	26.8%
男女比率（扣除外傭前）		（男）939：1,000（女）	（男）698：1,000（女）
男女比率（扣除外傭後）		（男）997：1,000（女）	（男）749：1,000（女）
適婚男女（25-44歲）比率（扣除外傭後）		（男）936：1,000（女）	（男）751：1,000（女）
結婚年齡中位數	男	30.8 歲	
	女	27.8 歲	
生育率（每千名女性誕下的嬰兒數目）		925	993

男女人口統計

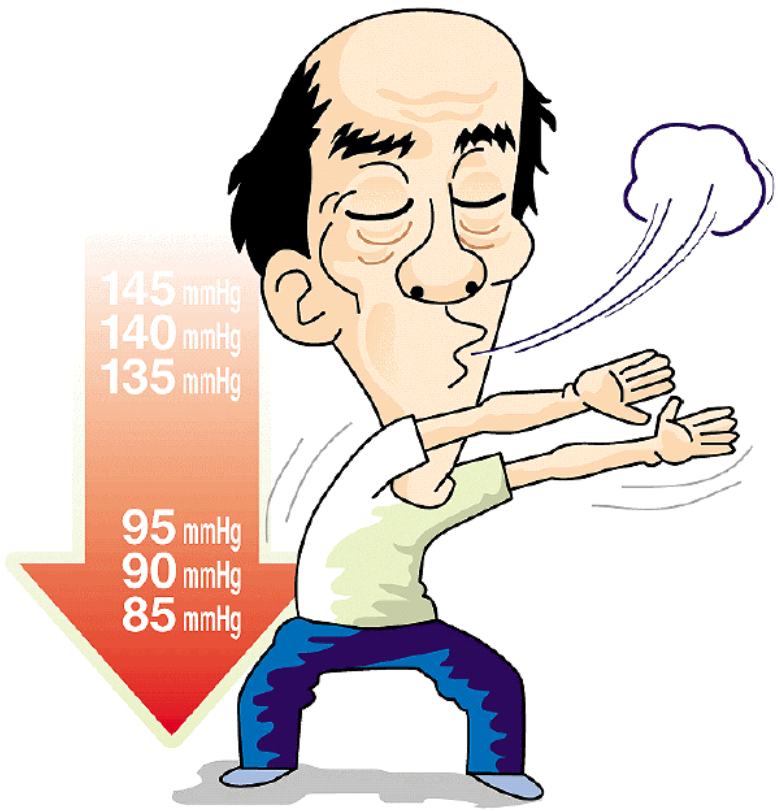
項目	1981年	2000年	2001年	2002年	2003年	2004年
人口(萬)						
女	248.4 (48%)	338.9 (51%)	343.8 (51%)	348.7 (51%)	350.9 (52%)	356.7 (52%)
男	270.0 (52%)	327.7 (49%)	328.7 (49%)	330.0 (49%)	329.4 (48%)	331.6 (48%)
					即女較男多25.1萬人	
初婚年齡中位數(歲)						
女	23.9	27.3	27.5	27.6	27.8	28.1
男	27.0	30.0	30.2	30.5	30.8	31.1
首長級公務員(人)						
女	35	280	297	311	311	305
男	679	989	992	993	953	899

Briefly describe some important messages you get from the above table / graph? Which information do you find most interesting? What is its interpretation?

For summarizing data of the Hong Kong population distribution, some information was presented using mean while some was presented using median. What is your opinion on them? What are the main differences between using mean, median and mode to present the central tendency of data? For each of them, can you suggest and explain one suitable situation (other than the above) of using it for measuring central tendency. Other than central tendency, which measurements you are interested in looking at to understand the distribution of the data? Elaborate.

Case 5: (Hypothesis testing)

The following study was undertaken in an effort to determine the effectiveness of two activities in reducing blood pressure of elderly patients having high blood pressure problems. One group (n = 47) was taught breathing exercise (氣功) and practiced it for 1 hour and 15 minutes in every morning and evening of 16 consecutive weeks. Another group (n = 41) did exercise such as stretching and walking for the same amount of time as the first group. (The following figure was extracted from Apple Daily on July 11, 2005)



氣功降血壓研究結果

病人		血壓水平（毫米水銀） 研究前	研究後
氣功組（47 人）	上壓	146.3	135.5
	下壓	93.0	87.1
運動組（41 人）	上壓	140.9	129.7
	下壓	93.1	86.0

資料來源：港大醫學院

高血壓小資料

病　徵	一般沒有病徵；血壓太高會可致暈眩、視線不清、頭痛、疲勞及面部發紅
併發症	心臟衰竭、冠心病、腎衰竭及中風
高危因素	肥胖、攝取過多鹽份、壓力、家庭成員曾患此病
預防方法	均衡飲食、適量體力活動、保持體重適中、減少食鹽、量度血壓

資料來源：衞生署

Problem-based TLAs in ISMT 352

- Role-play activities
- Collaborative business projects
- Problems driven by real data and recent events in risk management

Assessment Tasks

- Performance in the TLAs
- Including conceptual questions in the final exam
- Collaborative business projects
  - progress report
  - client's evaluation
  - peer review
  - commitment

Design of the Study

- We conduct three SPQs in the first lecture, the week after the midterm exam and the last week.
- We share with students their learning approach scores after doing the 2nd SPQ.
- We also collect feedback from students through some sharing sessions to understand better how they feel about the TLAs.

Statistical Results

Comparison between students with and without TLAs in 2005

Students with TLAs have higher deep approach scores and lower surface approach scores than students without TLAs.

	1st SPQ		2nd SPQ		3rd SPQ	
	L7 – Non L7		L7 – Non L7		L7 – Non L7	
	Mean S.D.	P-value	Mean S.D.	P-value	Mean S.D.	P-value
Deep Approach	1.25 5.78	0.0305**	2.81 5.49	<0.0001**	3.83 5.73	<0.0001**
Deep Motive	0.46 3.22	0.1565	1.49 3.07	<0.0001**	1.86 3.18	<0.0001**
Deep Strategy	0.79 3.07	0.0095**	1.32 2.92	<0.0001**	1.97 3.03	<0.0001**
Surface Approach	0.41 5.70	0.4676	-1.72 5.88	0.0064**	-2.61 6.13	0.0006**
Surface Motive	0.30 3.14	0.3322	-1.01 3.32	0.0048**	-1.18 3.35	0.0042**
Surface Strategy	0.11 3.27	0.7377	-0.72 3.21	0.0377**	-1.43 3.38	0.0006**

Comparisons of SPQ scores between students in L7 and Non-L7 lecture sessions

For students without TLAs, deep approach scores decrease and surface approach scores increase.

L7	3rd – 1st	
	Mean S.D.	p-value
Deep Approach	-0.21 5.65	0.7392
Deep Motive	0.12 2.93	0.7051
Deep Strategy	-0.33 3.47	0.3900
Surface Approach	-0.59 5.82	0.3823
Surface Motive	-0.03 3.46	0.9490
Surface Strategy	-0.54 3.22	0.1330

Change of average of individual SPQ scores in L7 in 2005

Non L7	3rd – 1st	
	Mean S.D.	p-value
Deep Approach	-2.60 6.08	<0.0001**
Deep Motive	-1.21 3.36	<0.0001**
Deep Strategy	-1.40 3.42	<0.0001**
Surface Approach	3.24 6.38	<0.0001**
Surface Motive	2.07 3.57	<0.0001**
Surface Strategy	1.17 3.66	<0.0001**

Change of average of individual SPQ scores in non L7 in 2005

Students with TLAs have higher understanding, reflection and critical reflection scores and lower habitual action scores than students without TLAs.

	L7 – Non L7 1st RTQ		L7 – Non L7 2nd RTQ	
	Mean S.D.	p-value	Mean S.D.	p-value
Habitual Action	-0.01 2.67	0.9850	-0.19 2.58	0.5474
Understanding	0.95 2.69	0.0006**	1.85 2.90	<0.0001**
Reflection	0.76 2.44	0.0028**	1.11 2.44	0.0002**
Critical Reflection	0.88 2.97	0.0042**	1.29 3.17	0.0009**

Comparisons of RTQ scores between Students in L7 and Non-L7 lecture sessions

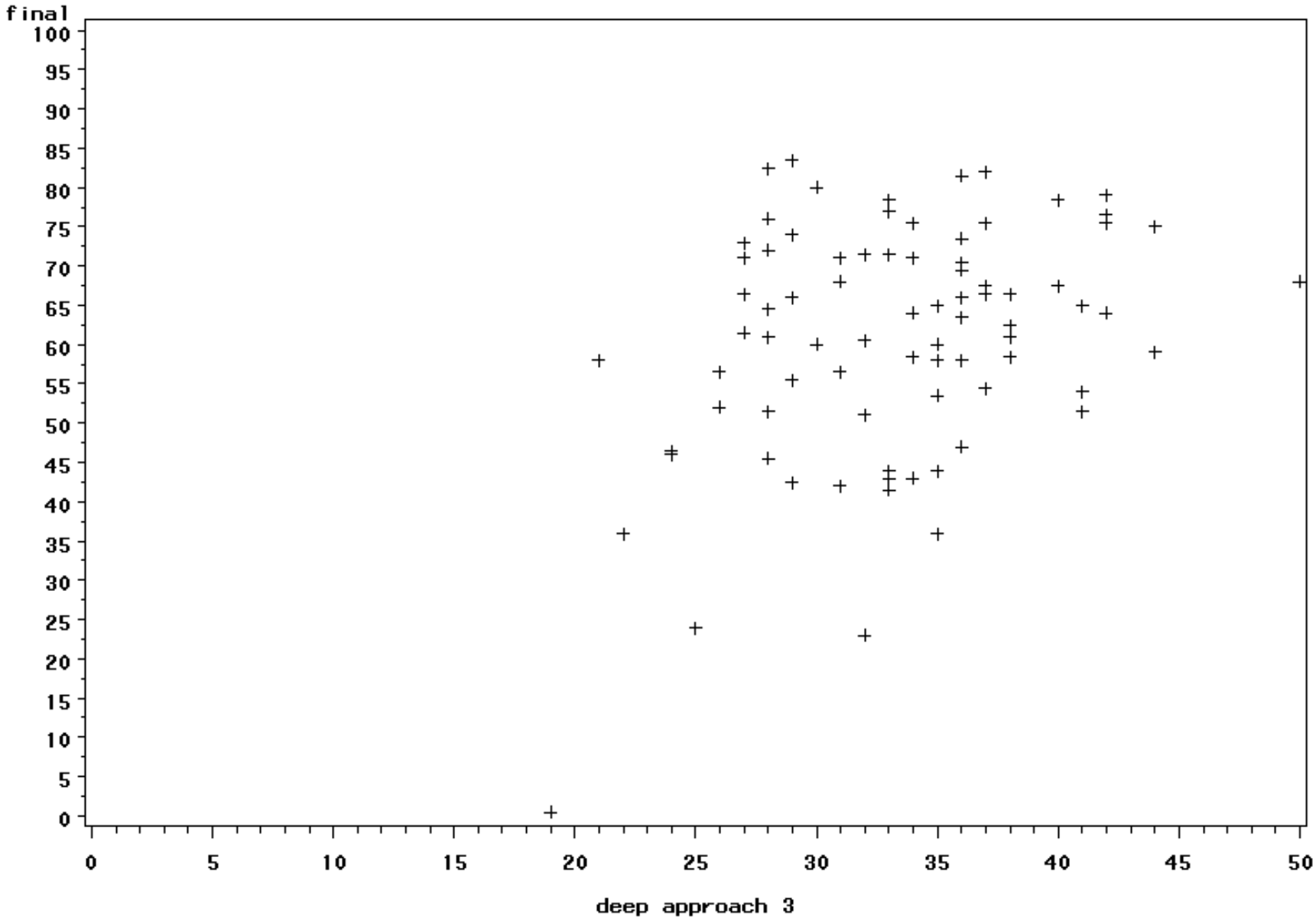
Students without TLAs have significant decrease in understanding and reflection scores after the semester.

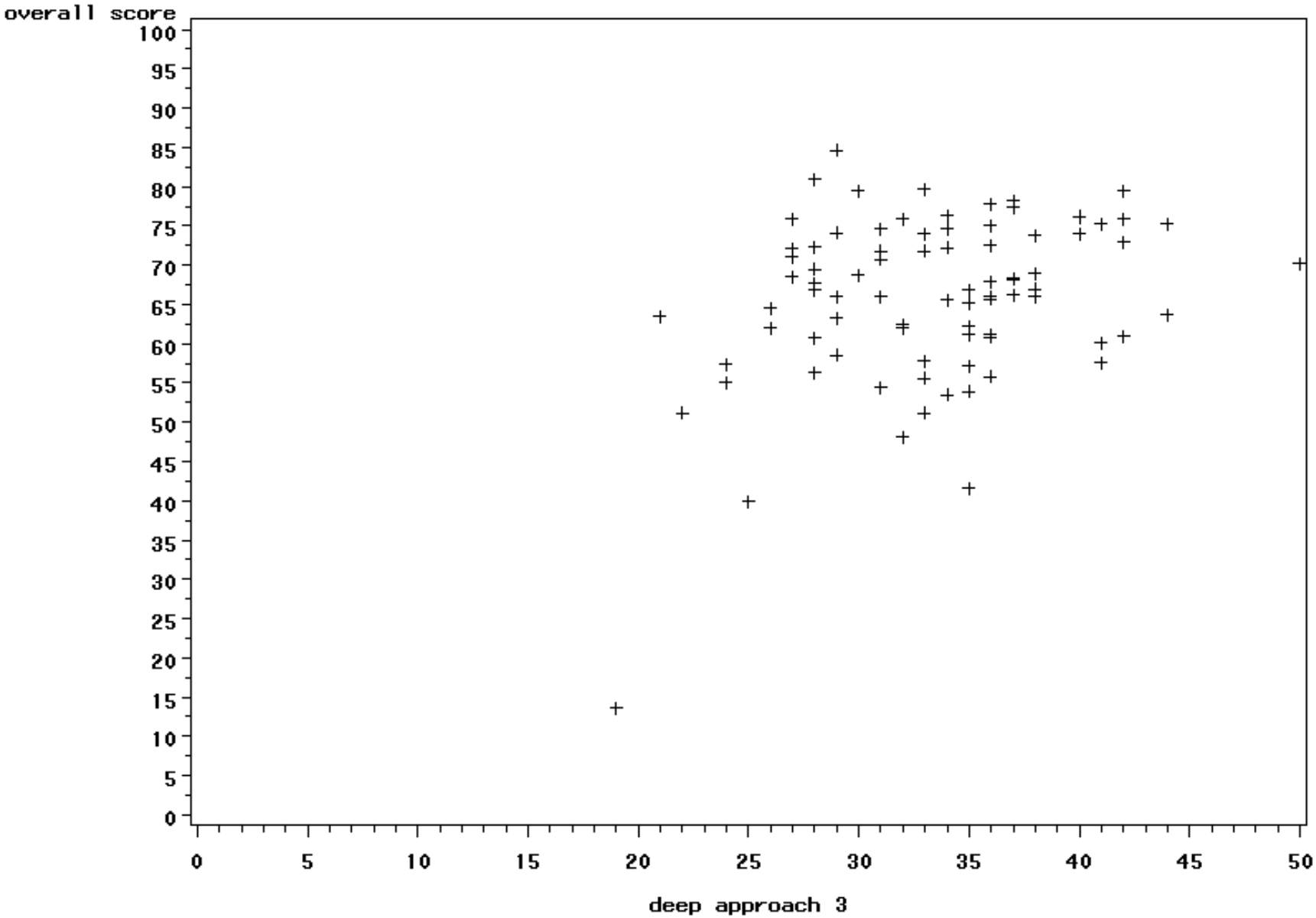
L7	2nd - 1st	
	Mean S.D.	p-value
Habitual Action	0.13 3.39	0.7406
Understanding	0.18 2.41	0.5146
Reflection	-0.82 2.29	0.0020**
Critical Reflection	0.53 3.22	0.1460

Change of average of individual score in RTQ in L7 in 2005

Non L7	2nd - 1st	
	Mean S.D.	p-value
Habitual Action	0.08 3.02	0.6645
Understanding	-0.94 3.15	<0.0001**
Reflection	-1.25 2.55	<0.0001**
Critical Reflection	-0.05 3.42	0.7939

Change of average of individual score in RTQ in non L7 in 2005





Challenge to Students of Using PBL

- Pay more afford to learn
- Time management issues
- Have to develop an attitude that being a successful learner doesn't simply mean having good exam results

Challenge to Teachers of Using PBL

- Spend more time to prepare
- Need more resources
- Take an active role to inspire our students
- Course evaluation by students

Final Remarks

- Biggs, Kember and Leung (2001)

Under some conditions of teaching and assessment, students made a strategic decision that a surface approach would see him through his tasks.

Teaching and assessment methods often encourage a surface approach when they are not aligned to the aims of teaching the subject.

End of the talk