Syllabus Review Task Force

Draft proposals for discussion
Zurich, April 2015

Andrew Gladwin

Introduction / Preamble

The future of the actuary…

"future education should foster the creativity that humans will need to set them apart from computers. There should be less rote-learning and more *critical thinking*."

The future is here already....

Australian airline takes over actuarial consultancy to access "big data" expertise

Actuarial Society of South Africa about to launch first specialist actuarial exam in banking

Over 2500 actuaries now have CERA, global enterprise risk management actuarial qualification

At ICA 2014, CEOs say that want actuaries to be more "business savvy"

Why is the IAA focusing on educating the actuary of the future ?

- Changing world, changing workplace

- New skills required for the future which are not part of current education syllabi

- Many actuarial societies experiencing change in the demand for actuaries (decline in traditional areas, opportunities in new areas)

- Consequently many actuarial societies relooking at structure and delivery of actuarial education

- These factors drove the formation of the Educating Future Actuaries Task Force in October 2013. The Task Force reported to the IAA Education Committee

Recommendations of the Educating Future Actuaries Task Force

- Unique value of the actuary seen as being a professional risk manager (i.e. understanding, being able to model risk, but essentially also having a professional underpin)

- Generic toolkit of an actuary should be able to be applied in a number of current and new fields of practice

- Could be combined with specialist learning to enable actuary to play important roles in specialist area –but the core generic competencies will define an actuary

- IAA should undertake syllabus review taking into account these recommendations and ensuring actuaries are future-fit

Formation of Syllabus Review Task Force

- Formed September 2014 with brief to update IAA syllabus using recommendations from Educating Future Actuaries Task Force
- Members

Chair:	Andrew Gladwin (South Africa)
Members:	Stephen Eadie (Canada)
	Paul King (UK)
	John Shepherd (Australia)
	Pat Teufel (USA)
	Marjon Tjia (Netherlands)
	Henning Wergen (Germany)
IAA Staff Liaison:	Karla Zuñiga

Recommended Framework

Revised Bloom's Taxonomy (RBT)
Cognitive Process Dimension

Verbs → Objects ↓	1. **REMEMBER** Recognize, Recall	2. **UNDERSTAND** Interpret, Exemplify, Classify, Summarize, Infer, Compare, Explain	3. **APPLY** Execute, Implement	4. **ANALYZE** Differentiate, Organize, Attribute	5. **EVALUATE** Check, Critique	6. **CREATE** Generate, Plan, Produce
A. Factual Knowledge	A1	A2	A3	A4	A5	A6
B. Conceptual Knowledge	B1	B2	B3	B4	B5	B6
C. Procedural Knowledge	C1	C2	C3	C4	C5	C6
D. Metacognitive Knowledge	D1	D2	D3	D4	D5	D6

What is Different in the Updated Syllabus?

- Explicitly setting out the level and depth of coverage of syllabus objectives

- Strong technical underpin important –need to ensure this can be applied in a wide range of areas

- Ensuring an understanding and application of all types of risk

- Ensuring actuaries can work with and understanding the implications of big data

- Delivery/professional skills critical– including communication, business awareness, teamwork, project management

- Strengthening the professional/ethical underpin as this is critical to the brand of actuary

- Critical thinking/higher order skills increasingly important (e.g. not just understanding a model, but communicating the limitations of a model)

Is the Updated Syllabus Longer?

- It's a longer document….but this is because it sets out depth and level of coverage for each topic

- Impact may vary for each member, depending on current depth of coverage e.g. how deeply is the current topic of microeconomics interpreted

- Intention is that new topics in data, risk and professional skills replace in-depth coverage of areas that could be considered specialist (detailed life insurance formulae and mathematics)

- IAA is a minimum syllabus so members can include additional topics in their qualifications

Structure of updated syllabus

- Divided in 10 Learning Areas each with a number of subdivisions

- Each subdivision has a weighting which is an approximate but can assist in judging depth of coverage needed

- Each of these subdivisions has a number of related learning objectives, using the Revised Bloom's Taxonomy set out above as a framework to set out the type of knowledge required

- Within a subdivision, or even a specific learning objective, more than one type of knowledge or skill, or level of learning, may be covered

What makes a "good" education program?

"I expect you all to be independent, innovative, critical thinkers who will do exactly as I say!"

A good education program

- An education program has three basic elements:
  - Desired learning outcomes
  - Teaching/learning activities (TLA's)
  - Assessment
- In a good education program, these three elements are consistent - aligned as much as possible *

* Ref: Biggs, JB (2014) *Constructive Alignment in University Teaching*, HERDSA Review of Higher Education

Assessment: Key ingredient

- Profession wants a new member who IS an actuary; who thinks & practices "like an actuary" (at the level of a new entrant)

- Deeper than acquisition of competencies

- Old-fashioned, "time-serving", on-the-job apprenticeship to a master could be the best way of learning requisite knowledge & skills

- Not feasible for all students of all societies

- Challenge: How to replicate as much of master/student model as possible?

John Dewey said (almost a century ago):

"Give (the students) something to do, not something to learn; and the doing is of such a nature as to demand thinking;   learning naturally results."

"The goal of education is to enable individuals to continue their education."

Some implications:

- If actuaries are to be problem solvers, then raise them on solving problems

- For program design or evaluation, important to consider the whole program (desired outcomes, TLA's, assessment)

- Cannot ignore educational best practice

- IAA EC will need to adopt a flexible approach when evaluating delivery & assessment

- Need for sharing between member societies

Financial Systems

Financial Systems

- The aim of the Financial Systems learning area is to give an overview of the financial environment in which most actuarial work is undertaken

Financial Systems

- Apart from brief references (operating environment & financial regulation) in Actuarial Risk Management (9), many of these objectives were not explicitly addressed in old syllabus

- Approach: Expressed <u>generically</u> to allow for local contextualization (e.g. financial products) and for changes over time

- Mostly at RBT levels 1 & 2, necessary for higher level applying, analyzing, etc. when solving real world problems

Financial Systems

- Issues for debate:
  - Do other contextual factors need explicit mention?
  - Any other important relationships?
  - Appropriate types of assessment task?

Finance

Finance

- The aim of the Finance learning area is to enable the student to apply the core principles of financial theory, accounting, corporate finance and financial mathematics to actuarial work

Finance

- Broadly based on Financial Mathematics (1) and Accounting (4)

- Covers elements of Investment & Asset Analysis (8)

- More detailed descriptions of knowledge to be learned and how that knowledge is to be used

- Taxation principles (personal, corporate, investments) are explicitly included

- Current Accounting (4) topics expanded

Finance

- Issues for discussion
  - More analysis & evaluation needed?
  - Appropriate types of assessment task?

Henning Wergen

Mathematics / Statistics / Economics

Assets

Definition of an actuary

- Actuaries fulfill many roles in a broad range of environments, including insurance companies, health organizations, pension plans, risk management, government, regulatory regimes, and in other fields
- They have a detailed understanding of economic, financial, demographic and insurance risks and expertise in:

  – developing and using statistical and financial models to inform financial decisions;

  – pricing, establishing the amount of liabilities, and setting capital requirements for uncertain future events

From: IAA, The role of the actuary, June 2013

Definition of an actuary

- An actuary is a business professional who deals with the financial impact of risk and uncertainty. Actuaries provide assessments of financial security systems, with a focus on their complexity, their mathematics, and their mechanisms

- Actuaries mathematically evaluate the probability of events and quantify the contingent outcomes in order to minimize the impacts of financial losses associated with uncertain, undesirable events

From: Wikipedia

Necessary fundamentals

- Mathematics

- Statistics

- Economics

- Assets

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From: Wikipedia

Mathematics

Aim: To give students an adequate mathematical foundation to develop and apply additional mathematical skills required for success in subsequent actuarial education

- Functions and sets
- Differentiation
- Integration
- Sequences and series
- Differential equations
- Real and complex numbers
- Matrices and systems of linear equations
- Vectors, vector spaces and inner product spaces
- Probability

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Statistics

Aim: To enable students to apply core statistical techniques to actuarial problems

- Random variables

- Statistical inference

- Regression

- Bayesian statistics and credibility theory

- Simulation

Economics

Aim: To enable students to apply the core principles of microeconomics, macroeconomics and financial economics to actuarial work

- Macroeconomics

- Business application of microeconomics

- Financial economics

Assets

Aim: To enable students to apply asset valuation techniques and investment theory to actuarial work

- Investments and markets

- Asset valuation

- Portfolio management

- Investment strategy and performance measurement

Issues for discussion

- Mathematics:
  - Explicit learning area vs. guideline for required pre-knowledge?

- Statistics:
  - National associations might want to add additional topics or depth?

- Economics / Assets:
  - Learning objectives that might belong into a specialist education?

Paul King

Data & Systems / Modelling

Data & systems

Data & Systems

- The aim of the data and systems learning area is enable the student to apply methods from statistics and computer science to real-world data sets in order to answer business and other questions
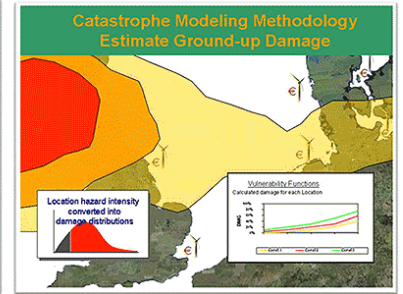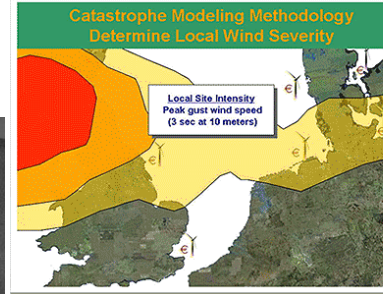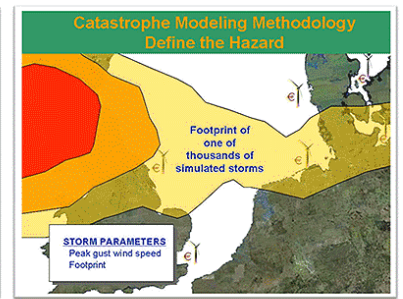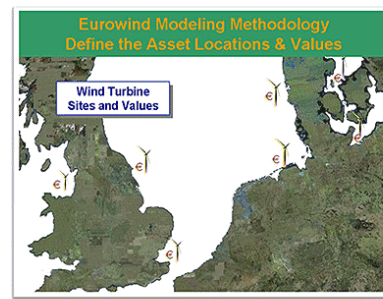
Data & Systems

- Our aim was to introduce some topics that can only really be taught with hands-on experience
  - Data handling
  - Computationally intensive statistical techniques
- And to raise the importance of data governance, protection and privacy
- Most of the topics are new to the IAA syllabus
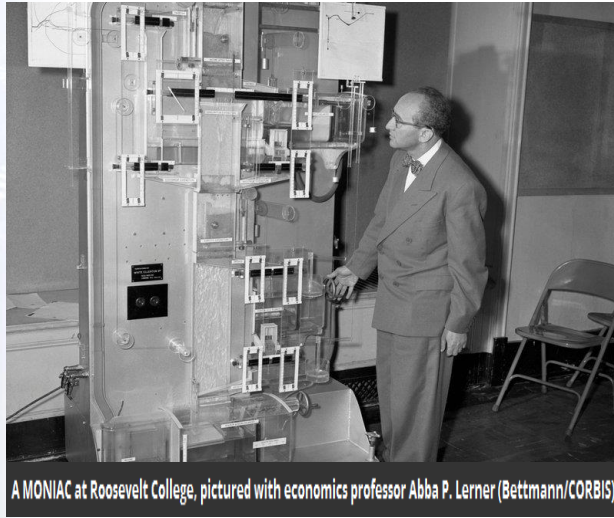
Data & Systems

- Issues for debate:
  - Fast evolving area – content flexible enough?
  - How much programming do we need to teach?
  - Balance between deep understanding and application?
  - Assessment of computer-based applications?

Models

Eurowind Modeling Methodology
Define the Asset Locations & Values

Catastrophe Modeling Methodology
Define the Hazard

Catastrophe Modeling Methodology
Determine Local Wind Severity

Catastrophe Modeling Methodology
Estimate Ground-up Damage

http://www.eqecat.com/

A MONIAC at Roosevelt College, pictured with economics professor Abba P. Lerner (Bettmann/CORBIS)

$$h(x) = \alpha e^{\beta x}, \qquad S(x) = \exp\left[\frac{\alpha}{\beta}\left(1 - e^{\beta x}\right)\right]$$

Models

- The aim of the Modelling learning area is to enable the student to apply stochastic processes and actuarial models to actuarial work

Models

- Our aim was to introduce a range of models and to present them in a way that encouraged a wide range of applications.

- Broadly covers Modelling & Actuarial Methods
  - Current Modelling syllabus is very general: we have added some detail
  - Current Actuarial Methods is quite specific to particular traditional actuarial techniques: we have tried to broaden the range and removed some detail (e.g. commutation factors, advanced life contingencies)

Models

- Issues for debate
  - Balance between principles and particular models
  - Range and depth of actuarial applications
  - Assessment – beyond paper/pencil/calculator?

Pat Teufel

Risk Management

Risk Management

- The aim of the risk management learning area is enable students to apply core aspects of enterprise risk management to the analysis of risk management issues faced by the entity and to recommend appropriate solutions

Risk Management

- Reoriented, broader perspective for this learning area

- Recognizes risk as fundamental to the work of an actuary

- Recognizes that management of risk applies regardless of industry

- Clear distinctions from CERA learning objectives (generalist vs. specialist tracks)

Risk Management

Risk Management

- Learning objectives mirror the risk management process itself
  - Risk Environment
  - Risk Identification
  - Risk Measurement and Modelling
  - Risk Mitigation and Management
  - Risk Monitoring and Communication
- Strong linkage with Personal & Professional Practice learning area

Risk Management

- Issues for debate
    - Have we clearly differentiated the generalist expectations from a specialist competency level?
    - Is the toolkit sufficiently robust to encompass a wide range of risk situations?
    - Are the Bloom's Taxonomy expectations set appropriately?

Steve Eadie

Personal and Professional Practice

Personal and Professional Practice

Personal and Professional Practice

- The aim of the Personal and Professional Practice learning area is to require use of enabling skills and professional requirements to improve students' actuarial work products

Recommended Framework

Revised Bloom's Taxonomy (RBT)
Cognitive Process Dimension

Verbs → Objects ↓	1. REMEMBER Recognize, Recall	2. UNDERSTAND Interpret, Exemplify, Classify, Summarize, Infer, Compare, Explain	3. APPLY Execute, Implement	4. ANALYZE Differentiate, Organize, Attribute	5. EVALUATE Check, Critique	6. CREATE Generate, Plan, Produce
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Personal and Professional Practice

- The aim of the Personal and Professional Practice learning area is to require use of enabling skills and professional requirements to improve students' actuarial work products.

Personal Practice

Enabling Skills

1. Communications
   - Implicitly included in prior syllabus
   - Proposing explicit examples to illustrate requirements
   - Know your audience
   - Different forms of communicating
   - Business oriented requirements
   - Higher cognitive level skills required
   - Don't just communicate – evaluate your success!

Personal Practice

Enabling Skills

2. Problem Solving and Decision Making
   - New?
   - Apply the Actuarial Control Cycle
   - Learn problem solving and decision making processes
   - Materiality
   - Project Management, Teamwork, Time Management
   - Evaluate Team Strengths and Weaknesses
   - Evaluate Decision-Making Processes

Personal Practice

- Issues for debate
  - Business Awareness/Skills
  - Decision Making Processes?
  - Team Management Skills?
  - Communication Skills?
  - What are the best delivery methods?
  - How do we assess student achievement?

Personal and **Professional Practice**

- The aim of the Personal and Professional Practice learning area is to require use of enabling skills and professional requirements to improve students' actuarial work products.

Professional Practice

Professional Requirements

1. Understand Professional Standards
   - In prior syllabus
   - Elements of a Profession
   - Role of ethics and professional standards in work
   - Structure and governance of the actuarial association
   - How rules and discipline apply to an actuary
   - An actuary's rights and obligations
   - Public Interest

Professional Practice

Professional Requirements

2. Apply Professional Standards
   - New?
   - Apply standards in case studies
   - Produce a Professional Development Plan
   - Monitor compliance with Professional Standards
   - Work documentation, checking and peer review
   - Higher cognitive level skills required
   - Don't just apply professional requirements; evaluate success!

Professional Practice

- Issues for debate

  – Generalist versus Specialist practice

  – What must the association control?

  – What are the best delivery methods?

  – How do we assess student achievement?

Personal and Professional Practice

- Questions?

Preparation for Tomorrow

- Consult with others tonight

- Prepare any questions and concerns

- Our group will meet to discuss today's meeting

Agenda Day 2

- Review of Day 1
  - Questions and Answers
  - Concerns
- What's next?
  - Consultation, Approval and Implementation
  - Integration/Future (Marjon Tjia)

DAY 2: EDUCATION SEMINAR

The hills are alive with the sound of education discussion…..

AGENDA

- ## 08h30-10h30

     7 specific issues-10 minutes each

     -General & Specialist (MT)

     -Foundation Areas? (HW)

     -Level of financial economics coverage (AG)

    -Extreme events/options (PK)

    -Insurance coverage (JS)

    -Depth of Personal & Professional Practice (SE)

   - Definition of Actuarial Work (PT)

   45 minutes open discussion

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AGENDA

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  45 minutes open discussion

AGENDA

- 11h00-12h30

  Integration Presentation (Marjon)
  Informal vote from education committee

  Next steps- discuss timeline for finalisation

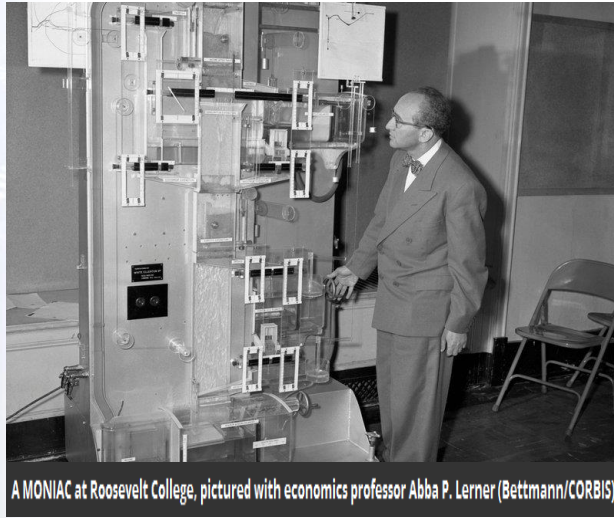 Implementation timeline

  Assessment

Paul King

Models

More Models
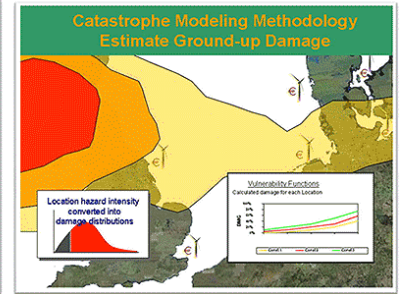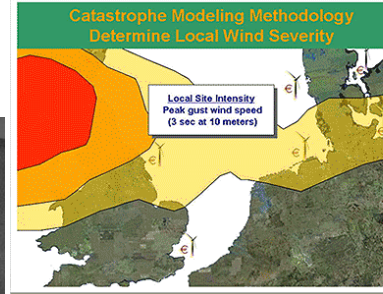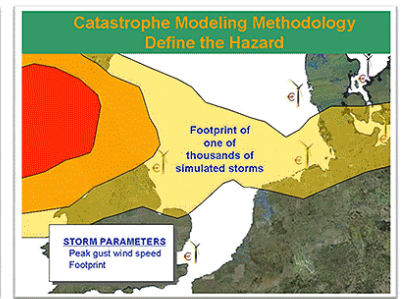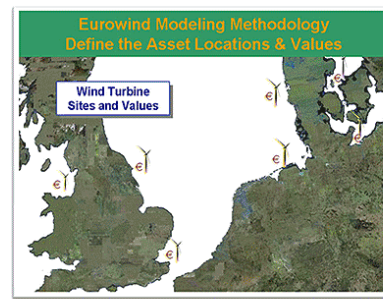
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Models

Capital and economic modelling [10%]

- Explain why financial institutions need capital and describe different capital measures. including regulatory capital and economic capital (B2)

- Describe the process of capital modelling. (C2)

- Describe different methods of risk aggregation and explain their relative advantages and disadvantages. (B2)

- Describe and apply the main concepts underlying the analysis of time series models. (B3)

Models

Fundamentals of severity models [15%]

- Recognize classes of distributions, **including extreme value distributions**, suitable for modelling the distribution of severity of loss and their relationships. (B4)

- Apply the following techniques for creating new distributions: multiplication by a constant, raising to a power, exponentiation, mixing. (B3)

- Calculate various measures of tail weight and interpret the results to compare the tail weights. (B5)

Educating Future Actuaries
The Big Picture
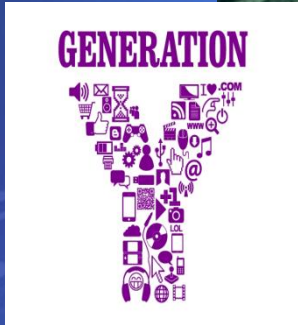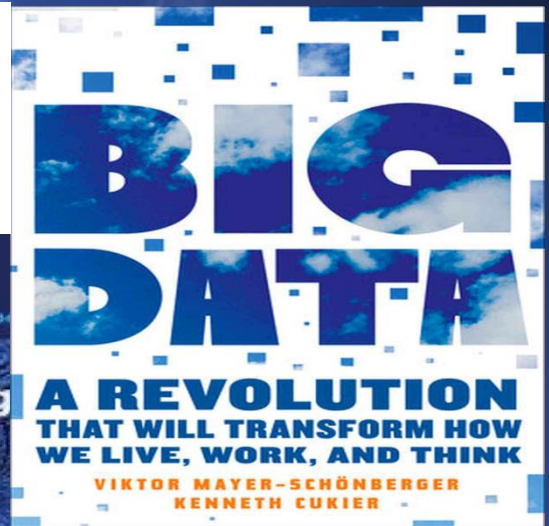
Educating Future Actuaries
Reflected in development of IAA Syllabus

Direction of thinking: Integration of knowledge and skills ..

- Move towards application of learning areas
- Use Bloom's Taxonomy to indicate depth and level
- Introduction broader risk concepts and big data to prepare for new work fields
- Stronger professional underpin
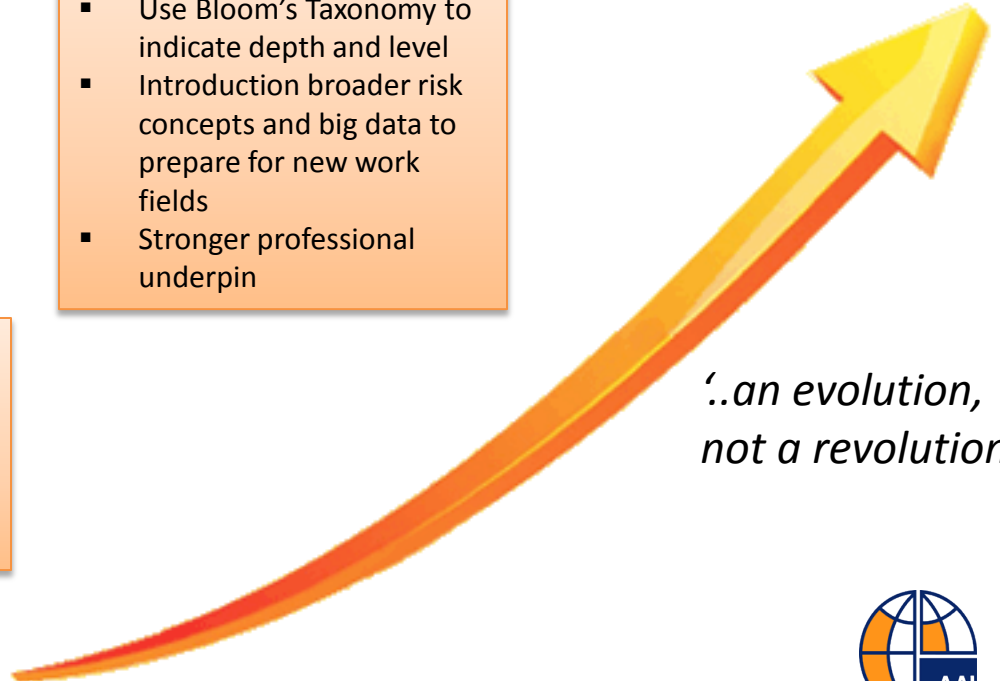
- List of topics
- Focus on knowledge
- No indication of depth and level
- Based on traditional actuarial work fields

'..an evolution, not a revolution..'

Integration Learning Areas
An example: Risk Management

Evaluate
Recommend measures based on risk profile

Create
Develop/ Revise Risk Strategy

Analyze
Quantify risk and interpret results

Cognitive level New Qualified Actuary ?

Apply
Build/ modify model

Understand
Explain concept of ERM

Remember
Describe types of risks

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Integration Learning Areas
How it can work: Risk Management (1)

Puzzle pieces:
- Knowledge/ Learning areas (red)
- Professional standards (blue)
- Enabling skills (yellow)
- Business acumen and Critical thinking (green)

Activities of Actuaries
- Evaluate relevant risk based on the corporate risk profile
- Select method to quantify risk
- Evaluate quality and relevance of data/ information for chosen method
- Quantify risks and evaluate results
- Evaluate non-quantifiable risks
- Prepare (draft) report for a specific audience on result and implications to be checked by supervisor
- Develop personal/ professional development plan accordingly

RBT Cognitive Skills: level C5

Integration Learning Areas
How it can work: Risk Management (2)

Learning Objectives
- Understand products of company, risk profile, market environment
- Understand interest of stakeholders
- Recognize and identify relevant risk
- Indentify methods to quantify risk
- Specify assumptions, data needed, verify integrity of data,
- Build or modify a model and explain its weaknesses
- Calculate risk and perform checks
- Understand communication techniques and choose appropriate communication method for target audience
- Recognize own limitations to task

Learning Areas
- Economics
- Risk Management
- Models
- Data and systems
- Statistics
- Personal and Professional Practice

Implementation of New IAA Syllabus
Thoughts and considerations

- (Introduction of) Integration across learning areas in Education System is encouraged when implementing the New Syllabus

- Flexibility is key
  - Teaching approaches
  - Assessment approaches
  - Timing
  - Support

- Share Best Practices !

SHARING &
LEARNING
TOGETHER

Prepare for the Future...
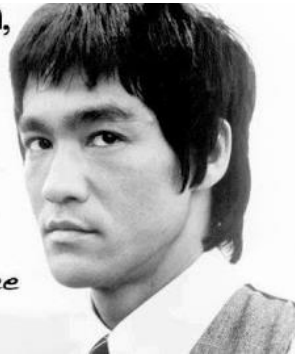## Feedback, Thoughts and Input are welcome

Knowing is not enough,
We must APPLY.
Willing is not enough,
We must DO.

– Bruce Lee

KEEP
CALM
prepare
FOR
CHANGE

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Thank you

www.actuaries.org

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