

Tvorba vědeckého textu

Session 2

jaroslav.hlinka@gmail.com

KES FSS MUNI
Brno 16. 3. 2017

Anatomy of a research project/paper

Anatomy of a research project/paper

- ▶ Wow! Hmmm?! I need to know this!
- ▶
- ▶ Do I really care? Why?
- ▶ Does anybody know already?
- ▶ How could I find out?
- ▶ Let's gather some evidence!
- ▶ So what have I learned?
- ▶ But what if?
- ▶ The answer is 42! Wow!? Hmmm!

Anatomy of a research project/paper

- ▶ Wow! Hmmm?! I need to know this! **Title**
- ▶ I need to tell everybody! **Abstract**
- ▶ Do I really care? Why? **Introduction I.**
- ▶ Does anybody know already? **Introduction II.**
- ▶ How could I find out? **Methods**
- ▶ Let's gather some evidence! **Data**
- ▶ So what have I learned? **Results**
- ▶ But what if? **Discussion**
- ▶ The answer is 42! Wow!? Hmmm! **Conclusion**

Research process

Structure of paper copies the research process:

- ▶ Title (and author list) - choosing a topic, forming a team
- ▶ Abstract [- summarize: usually the last step]
- ▶ Introduction - reviewing state-of-art, determine question
- ▶ Data and methods - designing research
- ▶ Results - analyzing evidence
- ▶ Discussion - limitations and bigger picture
- ▶ Conclusion - celebration

Zoo of motivations

Zoo of motivations

- ▶ Who cares?: me vs. the society
- ▶ Why?: practical vs. intellectual motivation

Activity: on the Question Quest

- ▶ list topics
- ▶ (re)introduce each
- ▶ check preferences

Determining research question

- ▶ **Feasible:**
 - ▶ Adequate number of subjects
 - ▶ Adequate technical expertise
 - ▶ Affordable in time and money
 - ▶ Manageable in scope
- ▶ **Interesting:** Getting the answer intrigues investigator, peers and community
- ▶ **Novel:** Confirms, refutes or extends previous findings
- ▶ **Ethical:** Amenable to a study that institutional review board will approve
- ▶ **Relevant:**
 - ▶ To scientific knowledge
 - ▶ To clinical, societal, technological policy/applications
 - ▶ To future research

Determining research question: guiding questions

Questions that may help:

Determining research question: guiding questions

Questions that may help:

- ▶ What exactly do you mean by ...?
- ▶ Who has already studied this question? What did they find?
- ▶ Where is the boundary between known and unknown in this area? Where is the knowledge gap?
- ▶ How could ... be determined/measured? Which methods can be used? How they differ? What are their limitations?
- ▶ How can the answer distilled from the data? How will I analyze it?

Activity: Generate specific research questions

Or shall we first check the evidence so far?

Searching for evidence

- ▶ looking for information sources
 - ▶ databases (ISI, google(scholar))
 - ▶ reference software (jabref, endnote, zotero, citeulike)
- ▶ evaluating evidence
 - ▶ Currency
 - ▶ Relevance
 - ▶ Authority
 - ▶ Accuracy
 - ▶ Purpose

Activity: Searching for evidence

Find three most relevant papers related to your question!
(teamwork, 10 minutes)







Team working strategies

Team working strategies

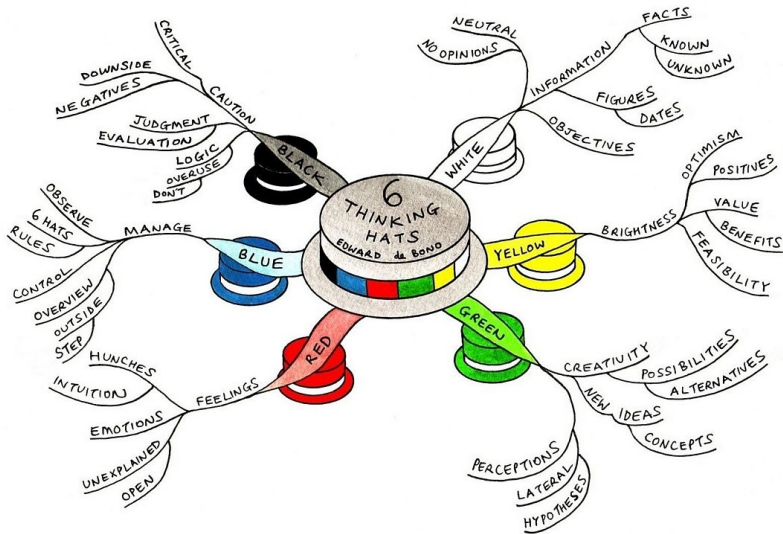
6 hats of de Bono

Team working strategies

6 hats of de Bono

COLOURED HAT	THINK OF	DETAILED DESCRIPTION
	<i>White paper</i>	The white hat is about data and information. It is used to record information that is currently available and to identify further information that may be needed.
	<i>Fire and warmth</i>	The red hat is associated with feelings, intuition, and emotion. The red hat allows people to put forward feelings without justification or prejudice.
	<i>Sunshine</i>	The yellow hat is for a positive view of things. It looks for benefits in a situation. This hat encourages a positive view even in people who are always critical.
	<i>A stern judge</i>	The black hat relates to caution. It is used for critical judgement. Sometimes it is easy to overuse the black hat.
	<i>Vegetation and rich growth</i>	The green hat is for creative thinking and generating new ideas. This is your creative thinking cap.
	<i>The sky and overview</i>	The blue hat is about process control. It is used for thinking about thinking. The blue hat asks for summaries, conclusions and decisions.

6 hats



Activity: Searching for evidence

Find three most relevant papers related to your question!
(teamwork, 10 minutes)

Analysing evidence: methodology notes

- ▶ reliability and validity

Analysing evidence: methodology notes

- ▶ reliability and validity
- ▶ representativity

Analysing evidence: methodology notes

- ▶ reliability and validity
- ▶ representativity
- ▶ statistical methods

Methodology notes - types of validity

Criterion validity

- Divided into concurrent (other criteria assessed simultaneously) and predictive (predicting future or past events) sub-areas
- Deals with whether the assessment scores obtained for participants are related to a criterion outcome measure
- For example for predictive, do SAT scores predict post-secondary performance?

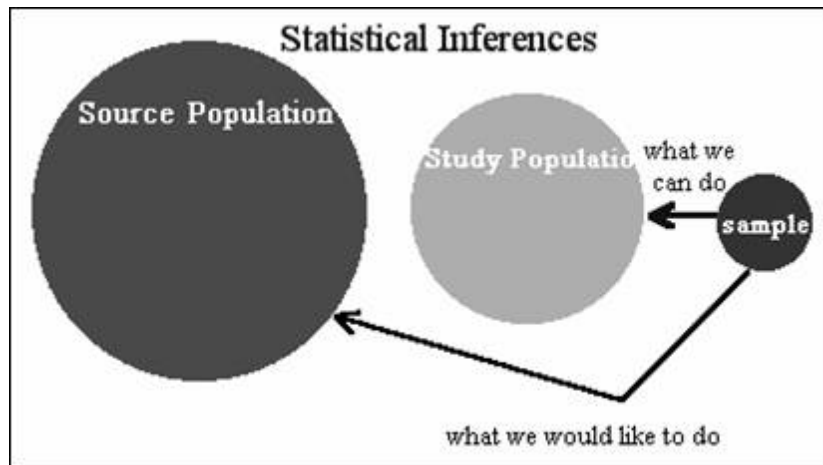
Content validity

- Deals with whether the assessment content and composition is appropriate given what is being measured (e.g., does the test reflect the knowledge/skills required to do a job or demonstrate that one grasps the course material)
- For example, is there an appropriate representation of questions from each topic area on the assessment that reflect the curriculum that is being taught
- Related to but not to be confused with "face validity"

Construct validity

- Deals with whether the assessment is measuring the correct construct (trait/attribute/ability/skill)
- For example, is this human biology exam actually measuring human biology constructs

Methodology notes - sample representativity



Methodology notes - statistical methods

Variable	Test
Nominal	McNemar's Test
Ordinal (Ordered categories)	Wilcoxon
Quantitative (Discrete or Non-Normal)	Wilcoxon
Quantitative (Normal*)	Paired t test

Methodology notes - statistical methods

		Outcome variable					
		Nominal	Categorical (>2 Categories)	Ordinal	Quantitative Discrete	Quantitative Non-Normal	Quantitative Normal
Input Variable	Nominal	χ^2 or Fisher's	χ^2	χ^2 -trend or Mann-Whitney	Mann-Whitney	Mann-Whitney or log-rank ^a	Student's <i>t</i> test
	Categorical (2>categories)	χ^2	χ^2	Kruskal-Wallis ^b	Kruskal-Wallis ^b	Kruskal-Wallis ^b	Analysis of variance ^c
	Ordinal (Ordered categories)	χ^2 -trend or Mann-Whitney	*	Spearman rank	Spearman rank	Spearman rank	Spearman rank or linear regression ^d
	Quantitative Discrete	Logistic regression	*	*	Spearman rank	Spearman rank	Spearman rank or linear regression ^d
	Quantitative non-Normal	Logistic regression	*	*	*	Plot data and Pearson or Spearman rank	Plot data and Pearson or Spearman rank and linear regression
	Quantitative Normal	Logistic regression	*	*	*	Linear regression ^d	Pearson and linear regression

Studying literature: reading strategies

Studying literature: reading strategies

- ▶ Posing questions
- ▶ Trying to pick up relevant information
- ▶ “How would I approach that question?”
- ▶ Looking for a specific answer vs. learning about the field (original research paper vs. review, book)

Studying literature: reading strategies

- ▶ Posing questions
- ▶ Trying to pick up relevant information
- ▶ “How would I approach that question?”
- ▶ Looking for a specific answer vs. learning about the field (original research paper vs. review, book)

Activity: studying a paper

- ▶ choose keywords

Studying literature: reading strategies

- ▶ Posing questions
- ▶ Trying to pick up relevant information
- ▶ “How would I approach that question?”
- ▶ Looking for a specific answer vs. learning about the field (original research paper vs. review, book)

Activity: studying a paper

- ▶ choose keywords
- ▶ searching a selected database

Studying literature: reading strategies

- ▶ Posing questions
- ▶ Trying to pick up relevant information
- ▶ “How would I approach that question?”
- ▶ Looking for a specific answer vs. learning about the field (original research paper vs. review, book)

Activity: studying a paper

- ▶ choose keywords
- ▶ searching a selected database
- ▶ pick a relevant paper

Studying literature: reading strategies

- ▶ Posing questions
- ▶ Trying to pick up relevant information
- ▶ “How would I approach that question?”
- ▶ Looking for a specific answer vs. learning about the field (original research paper vs. review, book)

Activity: studying a paper

- ▶ choose keywords
- ▶ searching a selected database
- ▶ pick a relevant paper
- ▶ read, refer, ask questions, re-read

Studying literature: reading strategies

- ▶ Posing questions
- ▶ Trying to pick up relevant information
- ▶ “How would I approach that question?”
- ▶ Looking for a specific answer vs. learning about the field (original research paper vs. review, book)

Activity: studying a paper

- ▶ choose keywords
- ▶ searching a selected database
- ▶ pick a relevant paper
- ▶ read, refer, ask questions, re-read

Determining research question

Activity: Determining research question

Determining research question

Activity: Determining research question

Questions that may help:

- ▶ What exactly do you mean by ...?
- ▶ Who has already studied this question? What did they find?
- ▶ Where is the boundary between known and unknown in this area? Where is the knowledge gap?
- ▶ How could be determined/measured? Which methods can be used? How they differ? What are their limitations?
- ▶ How can the answer distilled from the data? How will I analyze it?

Overly honest methods

<http://thenode.biologists.com/overly-honest-methods/>

- ▶ "Here's a typical plot of the data, by which I mean it was the prettiest one."
- ▶ "We added 888 uL because it's a lucky number in China."
- ▶ "Samples were analyzed between 2 days and 6 months post-collection, depending on when the freezer got full."
- ▶ "We tried several statistical confidence test, randomly. Here is the one that gives the coolest results! "
- ▶ "The reaction was heated to reflux overnight because it was time to go to the pub."
- ▶ "The hypothesis and rationale behind testing these compounds in this model system is we already had them in our fridge"
- ▶ "100 flies were dissected because that was all the undergraduate could manage"