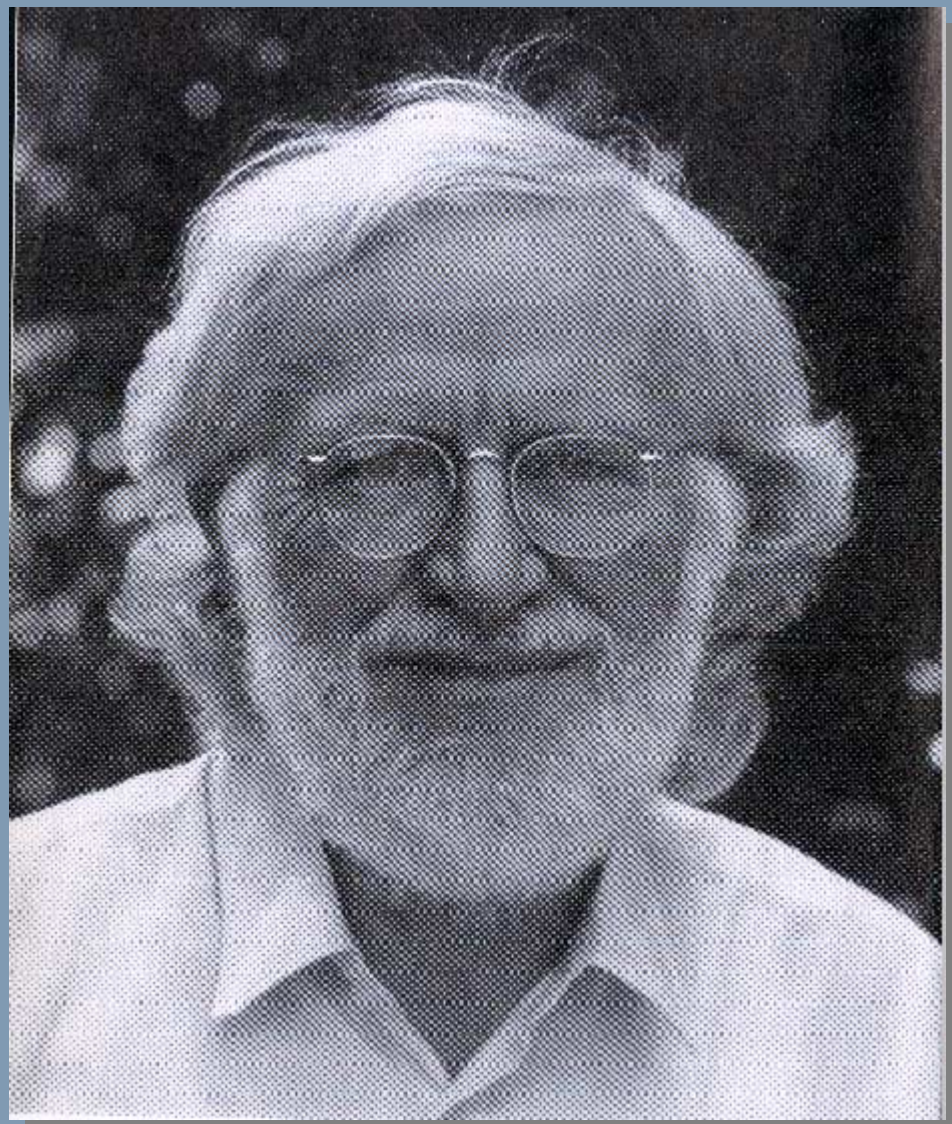


In the background you hear our discussion with Peter Naur
Friday 18, 2001

Teaching Process Reengineering at DIKU

Tietojenkäsittelytieteen päivät
May 21-22, 2001

Christopher Derek Curry
Jyrki Katajainen
Datalogisk Institut,
Københavns Universitet

Main Entry: **teach**
2 : to guide the studies of
3 : to impart the knowledge of
4 a : to instruct by precept, example, or experience

Main Entry: **pro·cess**
a series of actions or operations conducing to an end;
especially **:** a continuous operation or treatment especially
in manufacture

Main Entry: **engineer**
Text: to contrive or plan out usually with subtle skill or craft
Related Word arrange, contrive, devise, mastermind, plan (out), set up; intrigue, plot, scheme; manage, manipulate, negotiate; put (over), put (through), swing
Idioms pull strings (*or* wires)

Main Entry: DIKU
Deparment of Computer Science
Institute of Datalogy
Department of Computing
Department of Computing Science
Department of Datalogy
Institute of Computer Science

Contents of our presentation

- **Current tradition**
- Teaching process reengineering at DIKU
  - Grade database analysis
  - e-Survey : What do you know about your students?
  - Official actions by staff-student board at DIKU
- Our preliminary recommendations

Copenhagen

- Copenhagen – a good place to live and work
- Copenhagen is in the group of the 10 best cities in the World when it comes to the quality of life

Source: William M. Mercer, a London-based institute.

Øresund Science Region

Measured in terms of scientific output, Øresund region comes in as number five in research in Europe.

University	# of students	Web Site
University of Copenhagen	28.000	www.ku.dk
University of Roskilde	4.600	www.ruc.dk
Technical University of Denmark	7.600	www.dtu.dk
Copenhagen Business School	16.200	www.cbs.dk
IT University of Copenhagen (established1999)	456	www.itc.dk
Malmø University	5.000	www.mah.se
Lund University	36.000	www.lu.se
Royal Veterinary and Agricultural University	3.200	www.kvl.dk

Source: Each individual university, 1999/2000.

Datalogi – the Copenhagen tradition

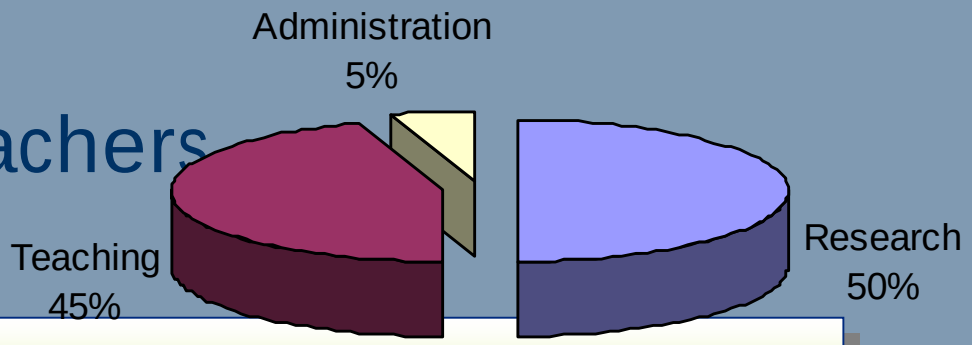
- The term *datalogi* comes from Peter Naur (see his letter to editor of the *Comm. ACM* **9**, 7 (1966), 485). Compare *tietologia, tietomatiikka, tietomaatti*.
- We are not mathematicians, not engineers, we are datalogists.
- Choose the subsidiary subject freely.
- Use of students independent work in small groups (3-4 students); more stress is put on experience than on knowledge.
- Relatively little lectures.
- Exams only once or twice a year.

Further details:

P. Naur: *Computing: A Human Activity*, ACM Press (1992)

E. Sveinsdottir and E. Frøkjær: Datalogy – The Copenhagen Tradition of Computer Science, *BIT* 28 (1988), 450-472.

Some words about the teachers



Foreign faculty members: 7

Position	# of employees	Salary (DKK)
Instructors (graduate students)	-	2.5 * 168/hr
Adjunk (Ph.D)	4	21-28.000
Supplement for adjunk		3.400
Supplement for datalogi		4.000
Lektor (Associate professor)	16	21-28.000
Supplement for lektor		5.600
Supplement for datalogi		4.000
Professor	5	21-28.000
Supplement for lektor		5.600
Supplement for datalogi		4.000
Supplement for professor		4.000
Secretary	10	-

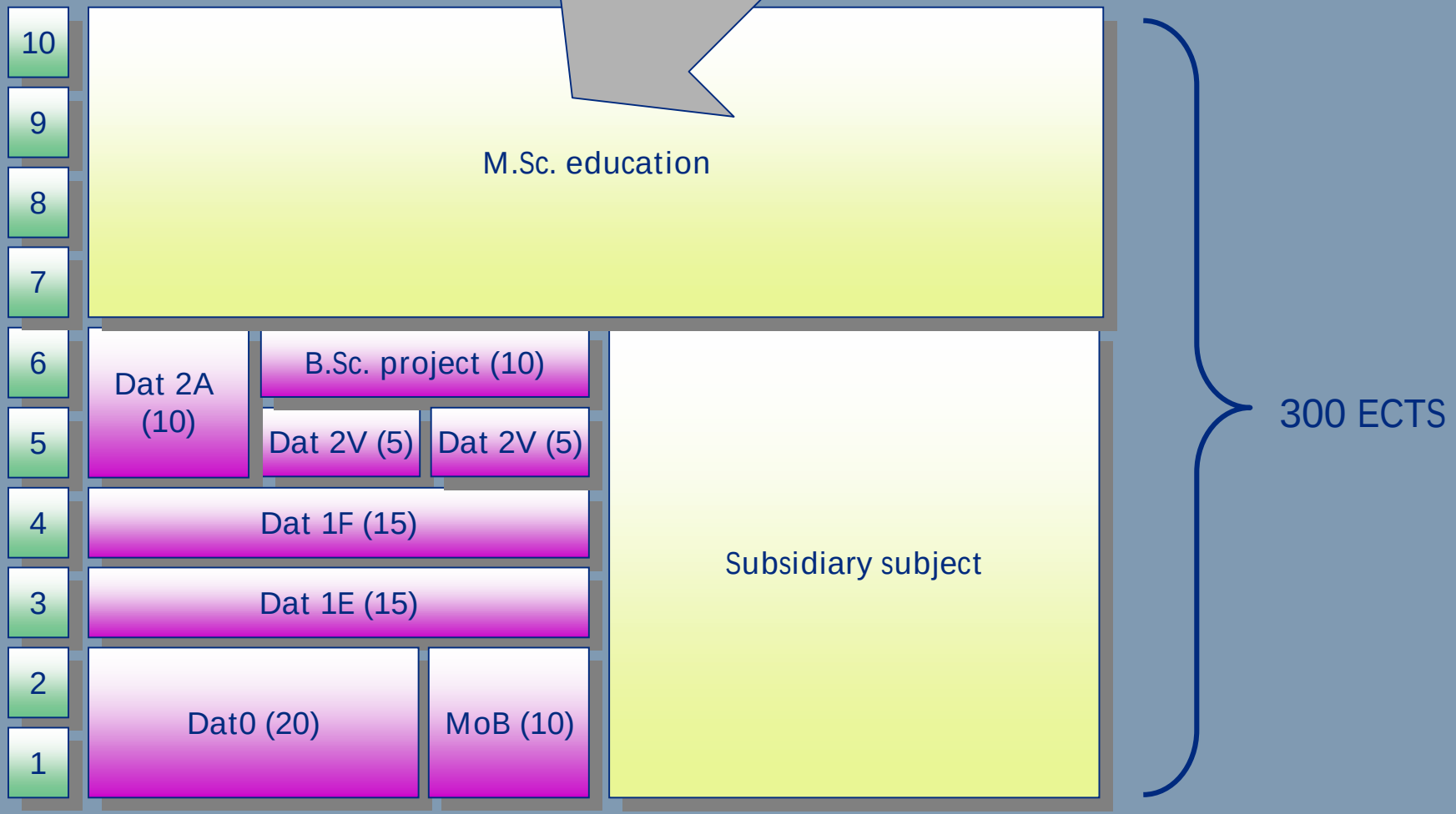
Exchange rate as of May 17: 100 FIM = 128.24 DKK

Why students choose us?

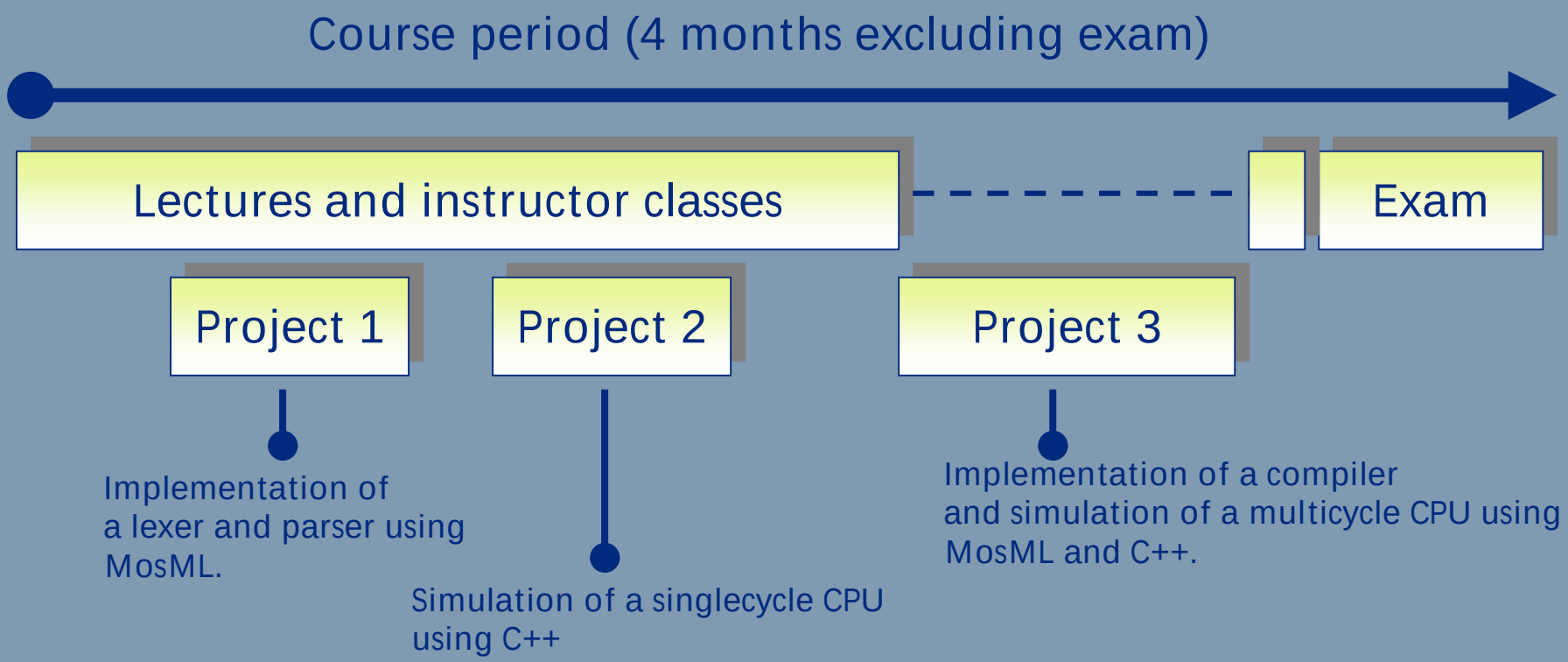
- Computers are the future.
- A dream I have had since childhood. I have been programming since I was 8.
- Computer science sounds interesting.
- DIKU offers a high quality education.
- DIKU is located in Copenhagen (not willing to move).
- Live in Copenhagen, friends live in Copenhagen.
- Random choice.
- University of Copenhagen offers the best education.
- Referred by current students/IT experts.
- Etc....

Overall study structure

- Algorithmics and Optimization Group
- Distributed Systems Group
- Information Systems group
- Logic Programming and Databases
- Musical Informatics Group
- Performance Engineering Laboratory
- Semantics of Programming Languages
- Image Group



Typical undergraduate course (Dat1E, 15 ECTS)



Course litterature

D. A. Patterson and J. L. Hennesy: *Computer Organization & Design, the Hardware/Software Interface*, Morgan Kaufmann (1993).

T. Æ. Mogensen: *Understanding Compilers*, DIKU (1999).

Danish speciality - Censur

- Educations of Natural Sciences must adhere to the departmental order BEK nr 694 af 30/08/1993 by the Ministry of Education (www.uvm.dk).
- **§ 21.** Exams are either internal or external.
  - 1) Internal exams are evaluated by the examinator, or examinator and one or more censors appointed by the University head.
  - 2) External exams are evaluated by the examinator and one or several censors appointed by the Ministry of Education.
- **§ 23.** 1/3 of the B.Sc. and M.Sc. education must be documented by external exams.

UNDERVISNINGS MINISTERIET

DIKU's revenue from teaching

- Revenue in terms of student productivity.

- 1 STÅ = 60 ECTS points = DKK 50.000.
- DIKU's STÅ approximately 260 per annum.
- Average STÅ per teacher = 10 STÅ = DKK 500.000.

- STÅ for 1 year course = 160 * 20 ECTS = 53,3 STÅ
- STÅ for 2 year course = 80 * 15 ECTS = 20 STÅ
- STÅ for 3 year course = 30 * 5 ECTS = 2,5 STÅ
- STÅ for 4/5 year course = 10 * 7.5 ECTS = 1.25 STÅ
- STÅ for M.Sc. thesis = 1 * 30 ECTS = 0.5 STÅ

- Ministry of Education funds the other half to cover research.

DIKU's crisis

Research money goes to Aarhus University or IT-C

Loss of qualified faculty members

Budget cuts

Difficult to get qualified instructors

High drop-out rate

Critics from former students:
- No visions
- Old fashioned

Contents of our presentation

- Current tradition
- **Teaching process reengineering at DIKU**
  - Grade database analysis
  - e-Survey : What do you know about your students?
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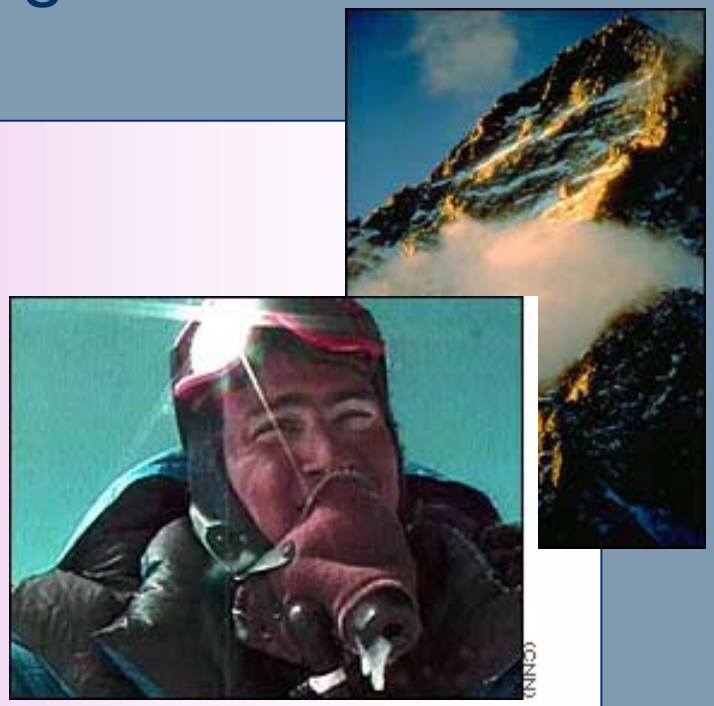
- Our preliminary recommendations

What is it like to study computing at DIKU?

”It takes commitment, DETERMINATION and self-sacrifice to complete a study such as computer science.

It’s REALLY like climbing a mountain. Sometimes there’s a marvellous view, and everything is truly magnificent, whereas at other times, the weather is bad, and you must clench your teeth in order to make it to the top.”



Anonymous student in DIKU e-Survey 2000

Why teaching process reengineering?

Teaching process reenginering is based on the principles of business process reengineering, but with focus on improved quality not reducing costs.

Business process reengineering (Hammer and Champy, 1993) is essentially value engineering applied to the system to bring forth, sustain, and retire the product, with an emphasis on information flow. By mapping the functions of the business process, low value functions can be identified and eliminated, thus reducing cost. **Alternatively, a new and less costly process, which implements the function of the current process, can be developed to replace the current one**.

Edwin B. Dean, NASA

The project – An overview

Data

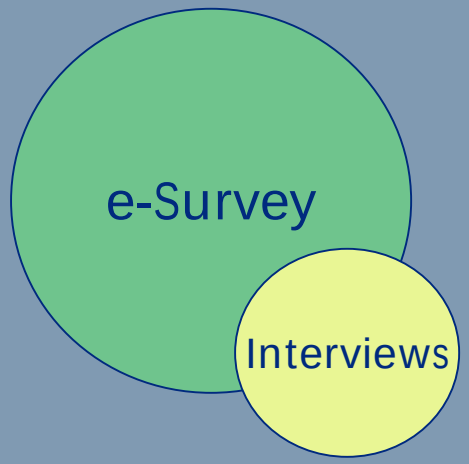
Grades

Database

e-Survey

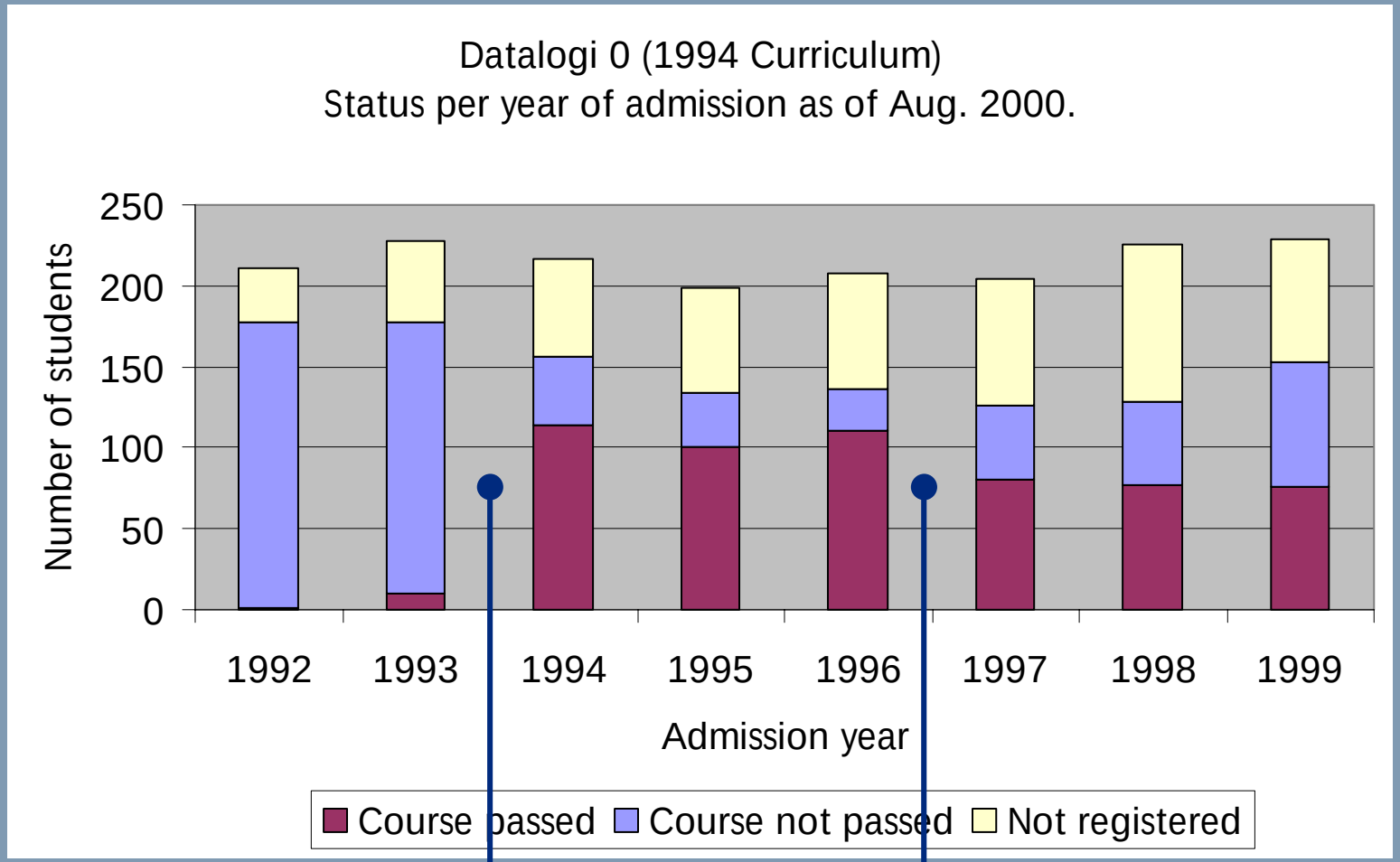
Interviews

Analysis

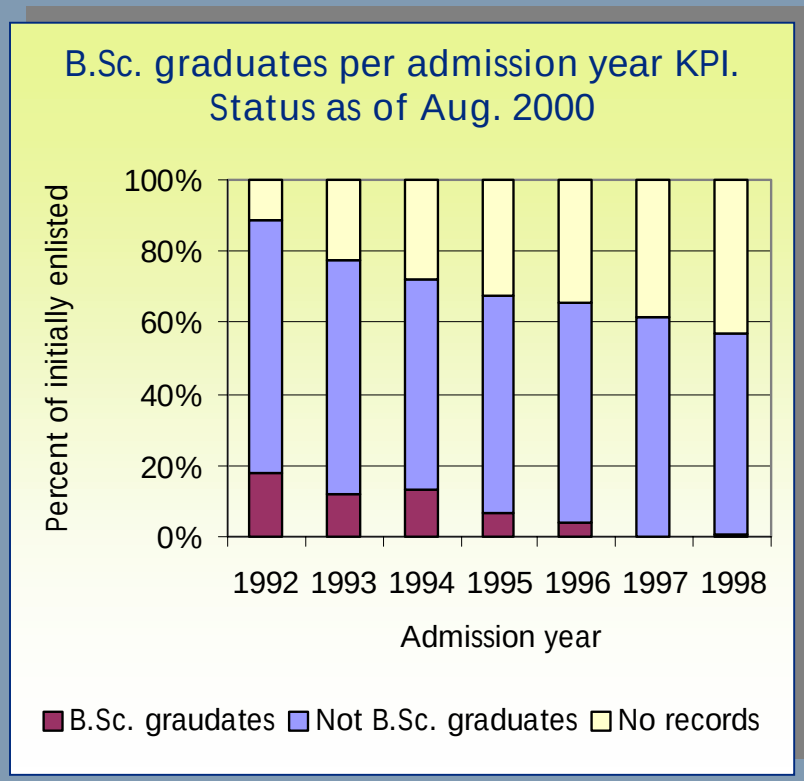


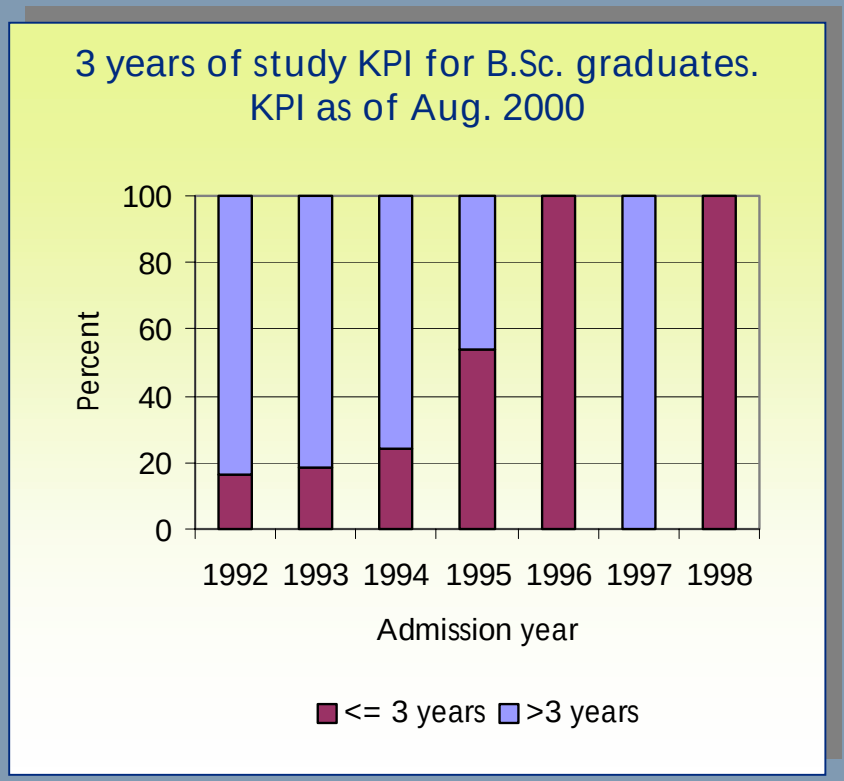
Key Performance Indicators

Status on first year exam



Key Performance Indicators (KPI) – B.Sc. graduates



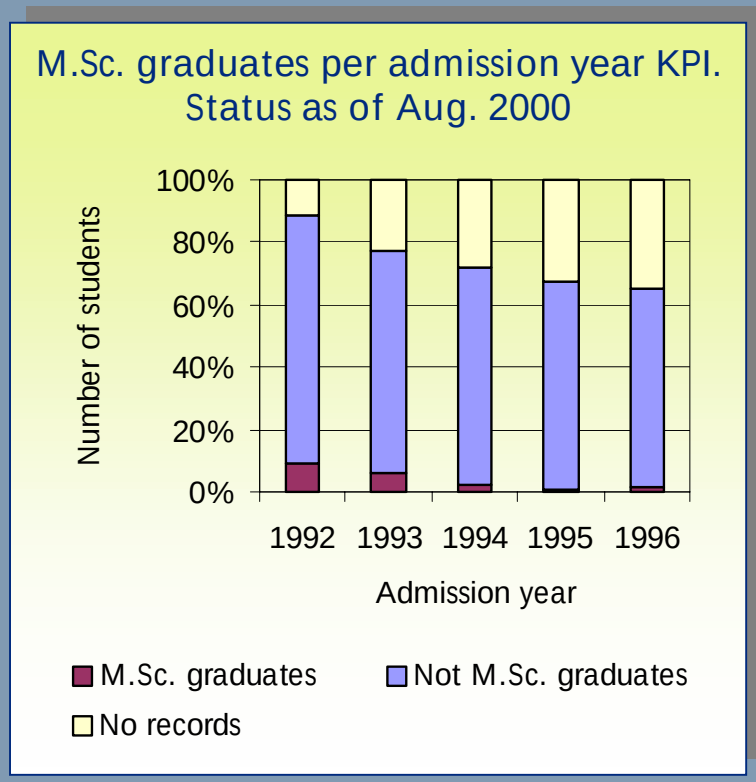


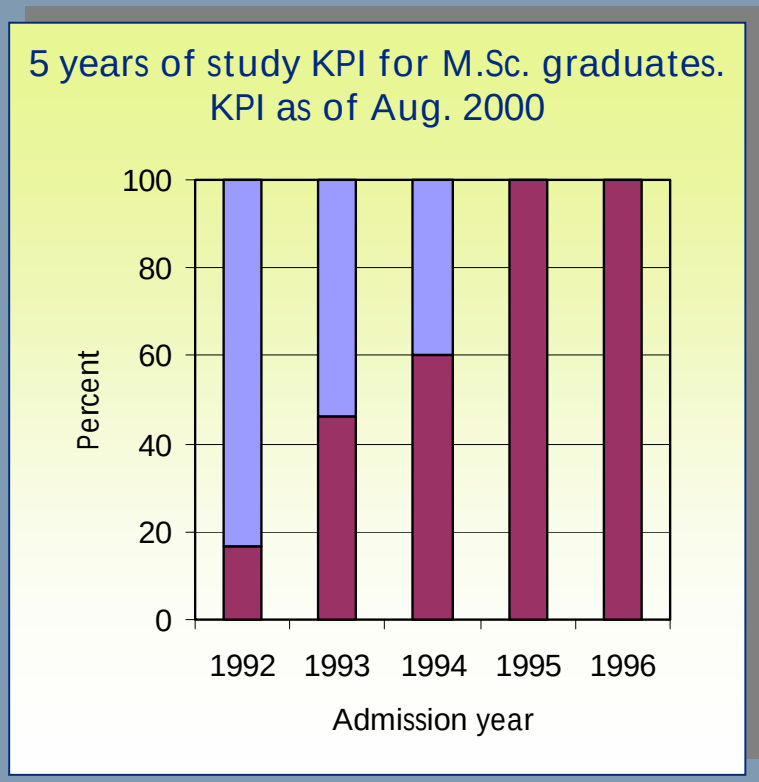
B.Sc. educations: Completion and drop-out (1998)

Bachelor	Fuldførte i %	Afbrudte i %		I alt
		Studieskift	Forlader udd.system	
Jura	73	21	7	100
HA	62	26	11	100
Økonomi	54	40	5	100
Samfund	71	22	7	100
Erhvervssprog	44	35	21	100
Sprog	46	46	8	100
Psykologi	77	15	8	100
Øvrige hum.	57	36	8	100
Nat.vid.	48	43	9	100
Landbrugsvid.	80	16	4	100

Source: Ministry of Education, www.uvm.dk

Key performance indicators – M.Sc. graduates





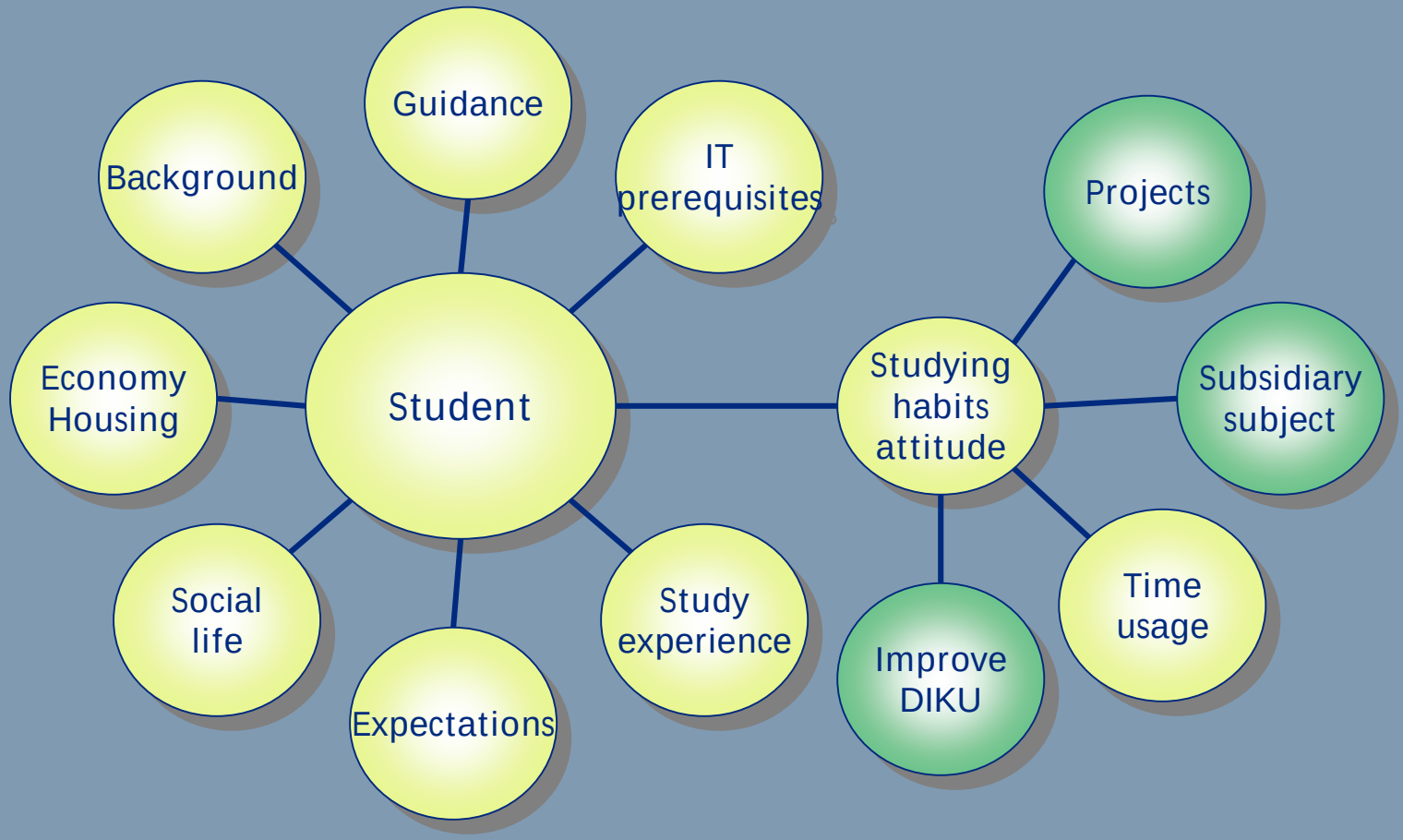
M.Sc. Educations: Completion and drop-out (1998)

Kandidat	Fuldførte i %	Afbrudte i %		I alt
		Studieskift	Forlader udd.system	
Jura	95	1	4	100
Merc.	77	4	19	100
Økonomi	87	4	9	100
Samfund	82	6	12	100
Erhvervsspro	64	13	23	100
Sprog	67	12	20	100
Psykologi	68	12	20	100
Øvrige hum.	71	12	18	100
Nat.vid.	75	10	16	100
Landbrugsvid	99	1	0	100

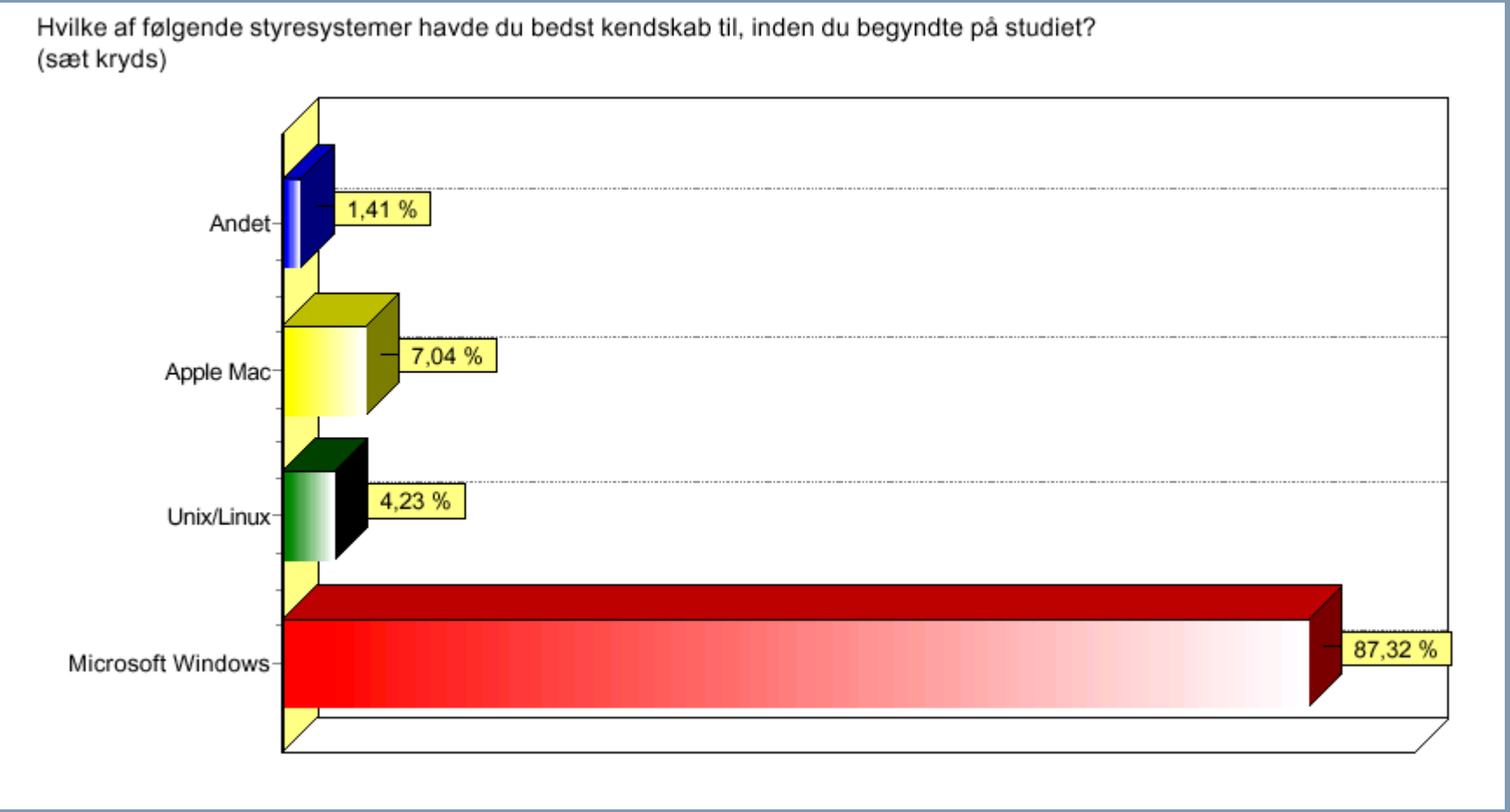
Source: Ministry of Education, www.uvm.dk

e-Survey objectives

What do you know about your students?

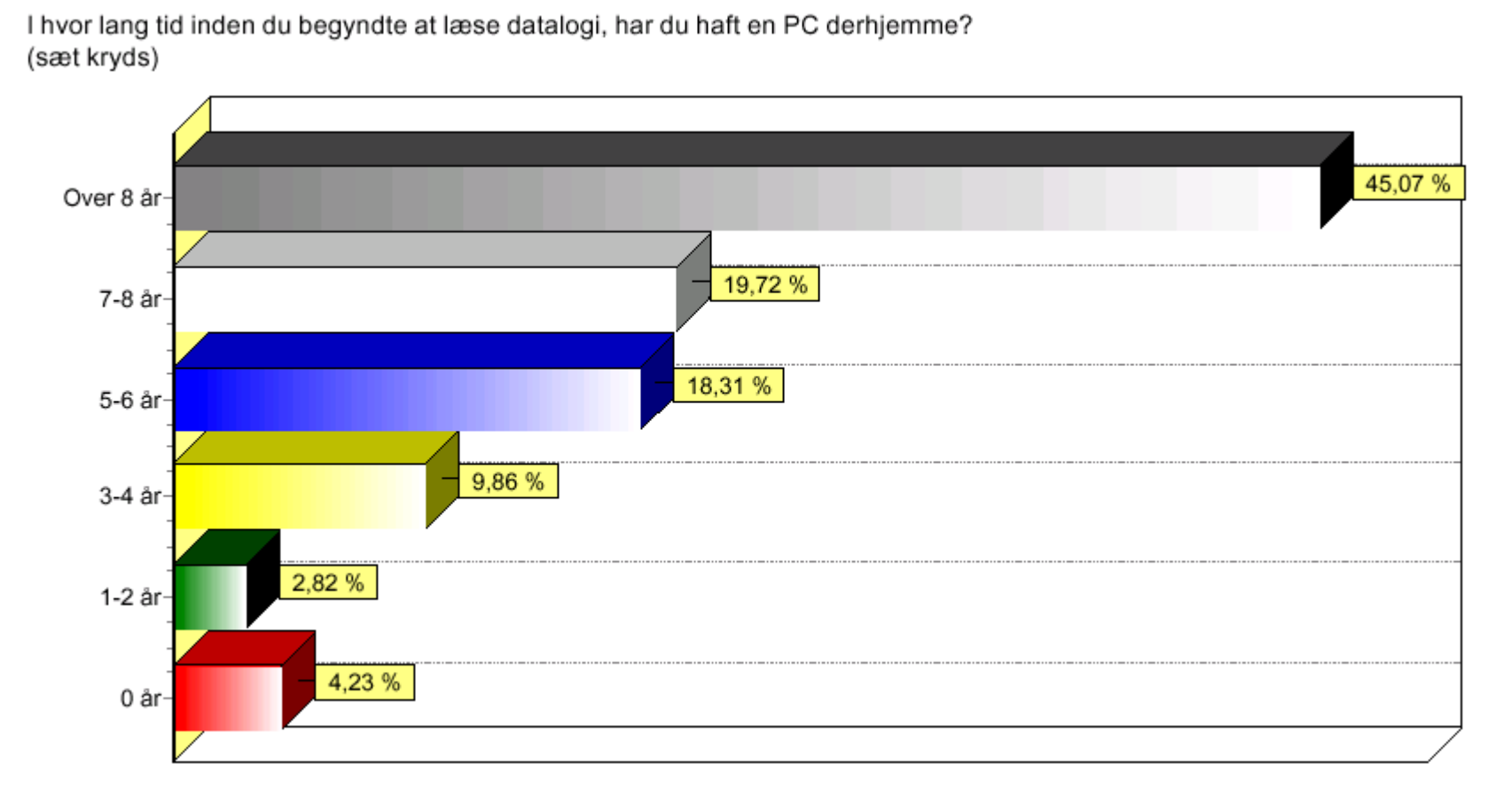


e-Survey: IT prerequisites



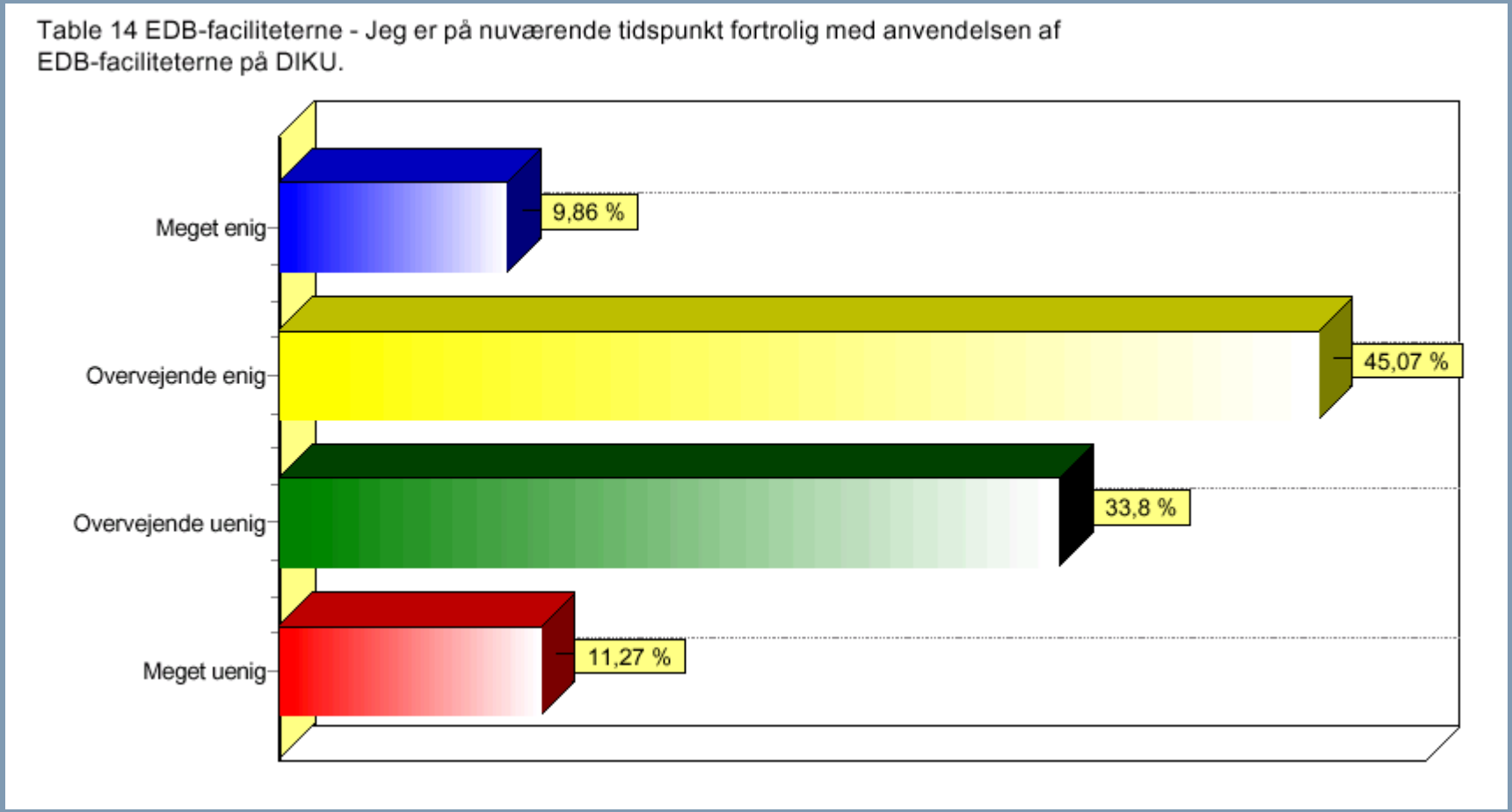
Source: Survey of first year students

e-Survey: PC at home prior to studying at DIKU.



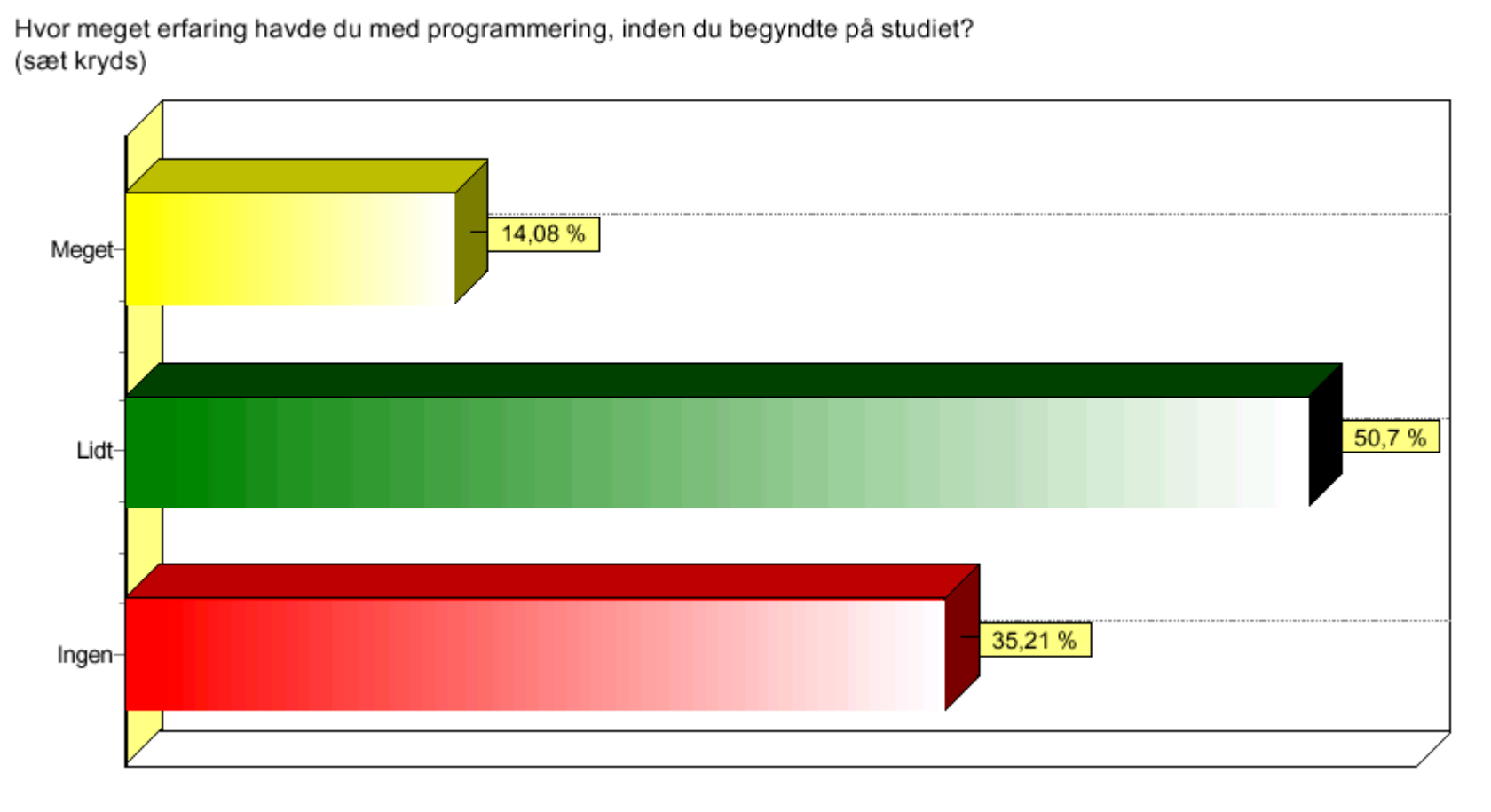
Source: Survey of first year students

e-Survey: Familiarity with DIKU's IT systems



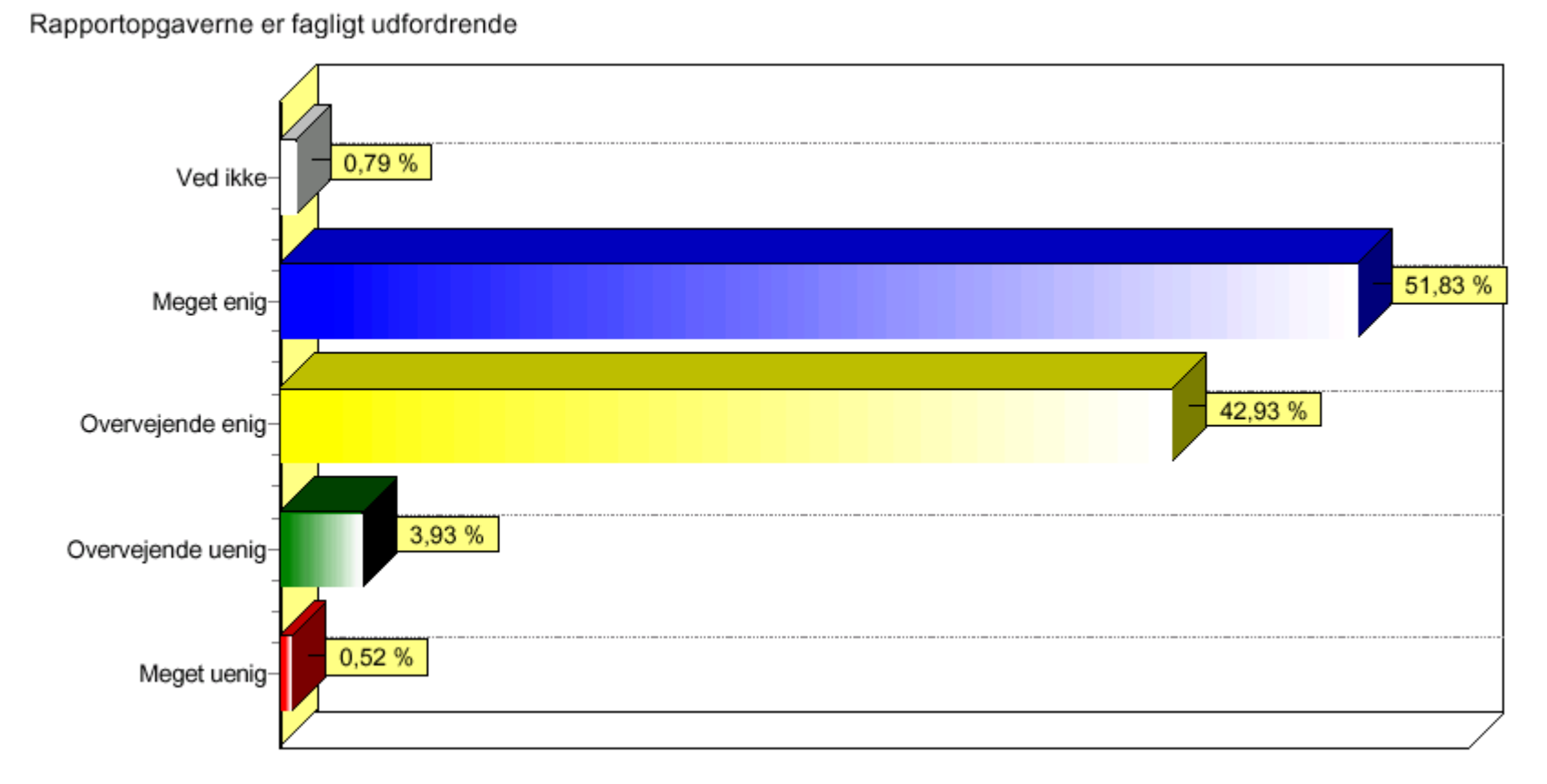
Source: Survey of first year students

e-Survey: Programming experience



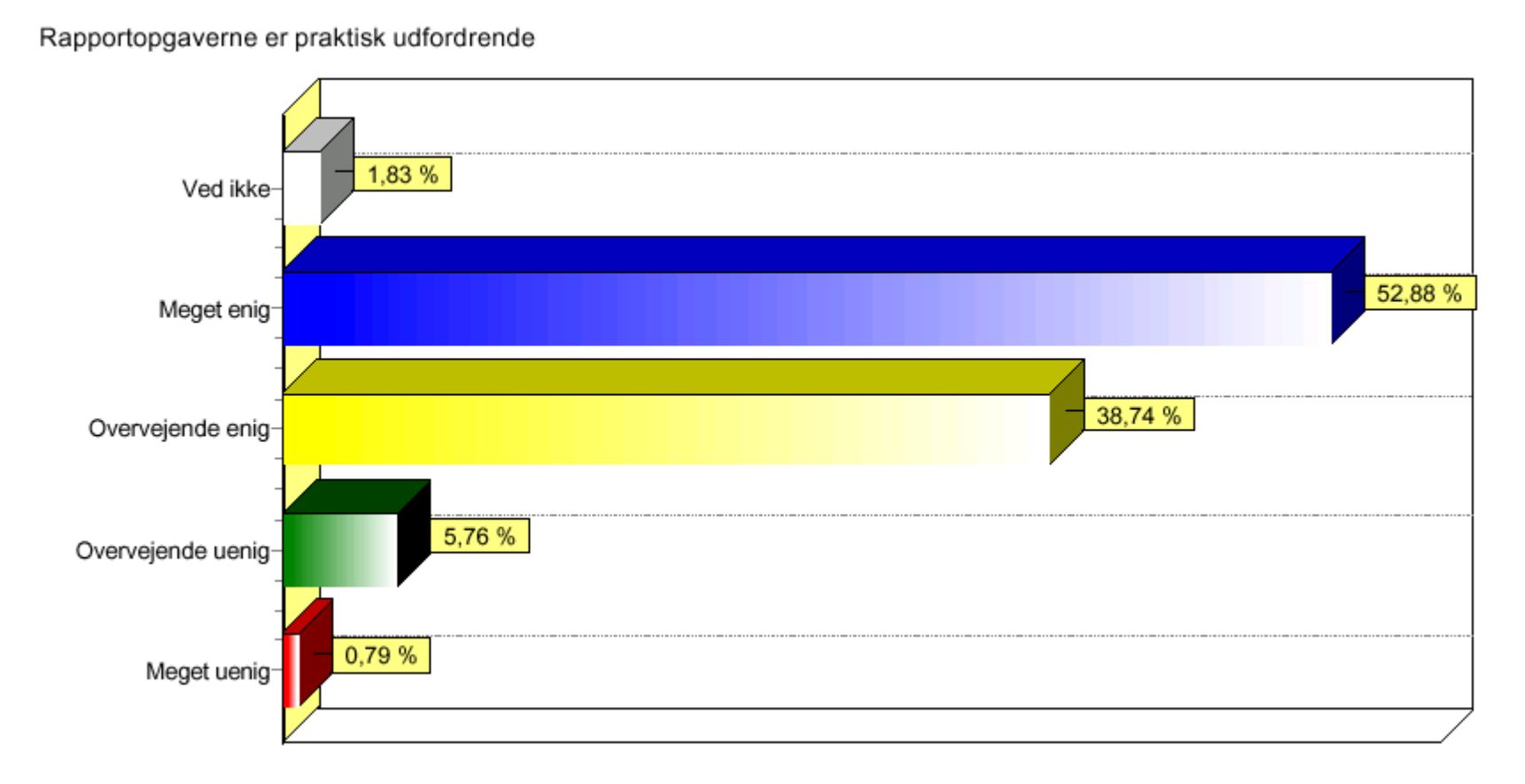
Source: Survey of first year students

e-Survey: Our the projects are scientifically challenging



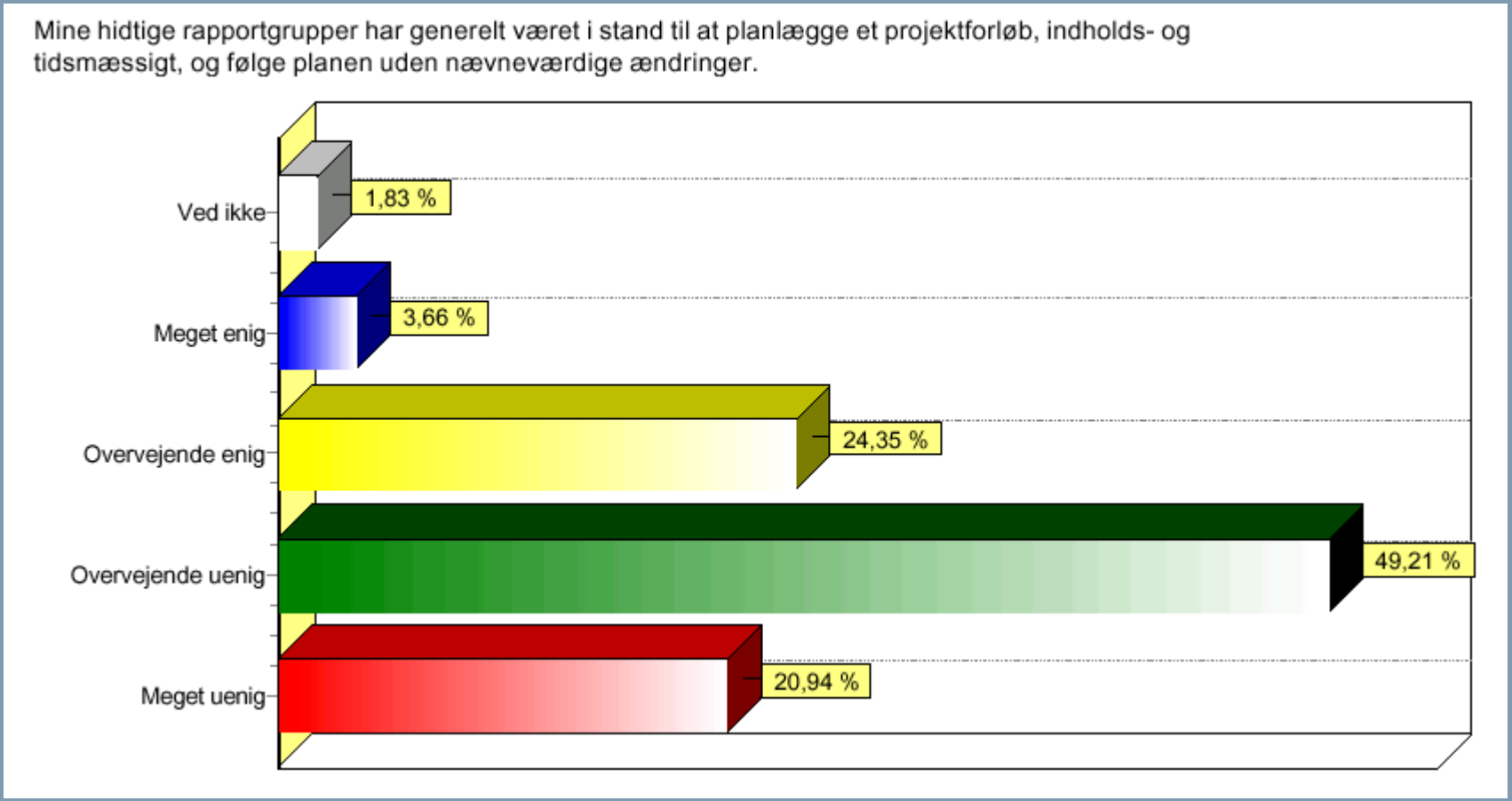
Source: Survey of >1 year students

e-Survey: Our projects are practically challenging



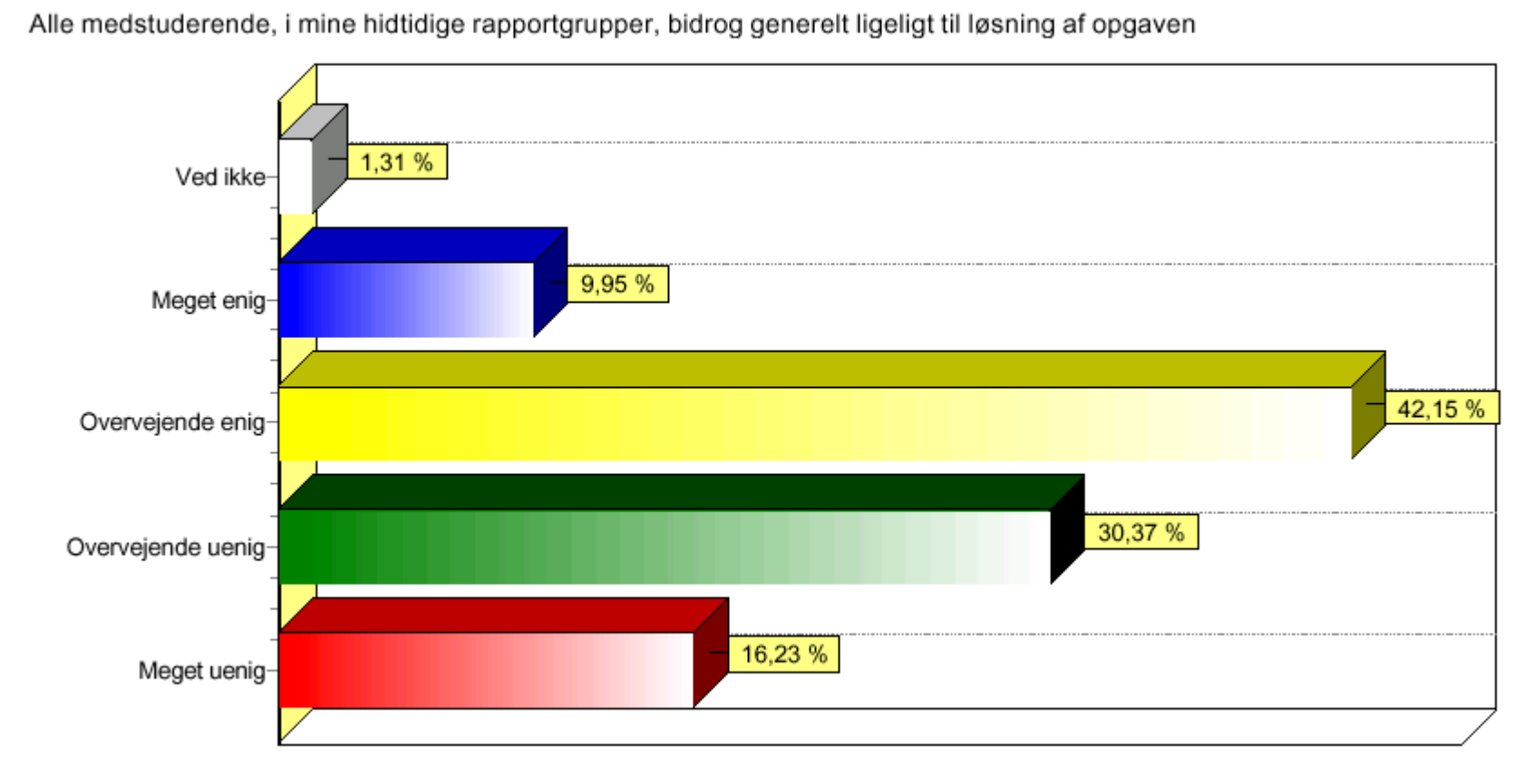
Source: Survey of >1 year students

e-Survey: You plan ahead and keep deadline



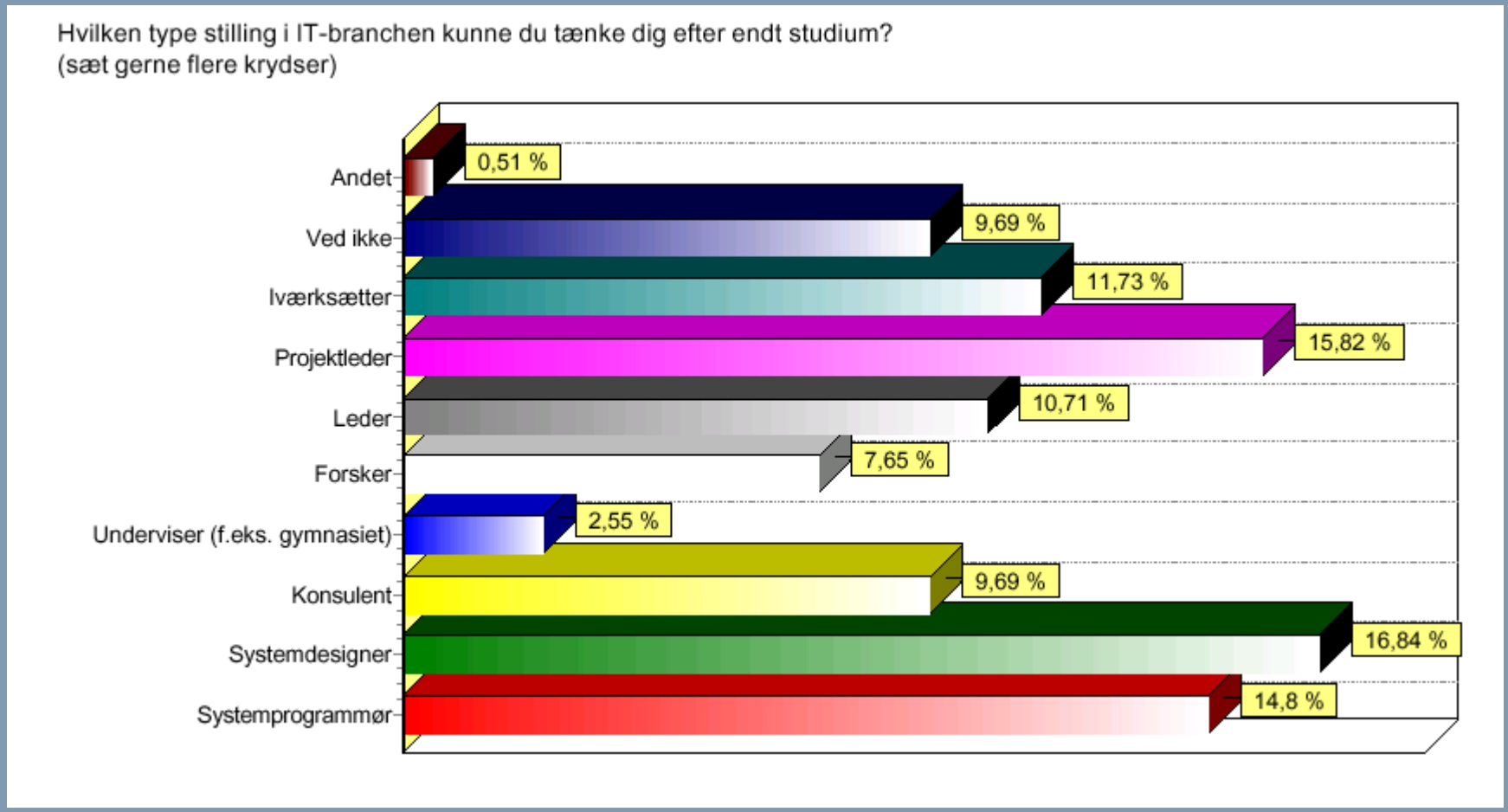
Source: Survey of >1 year students

e-Survey: All team members contribute equally



Source: Survey of >1 year students

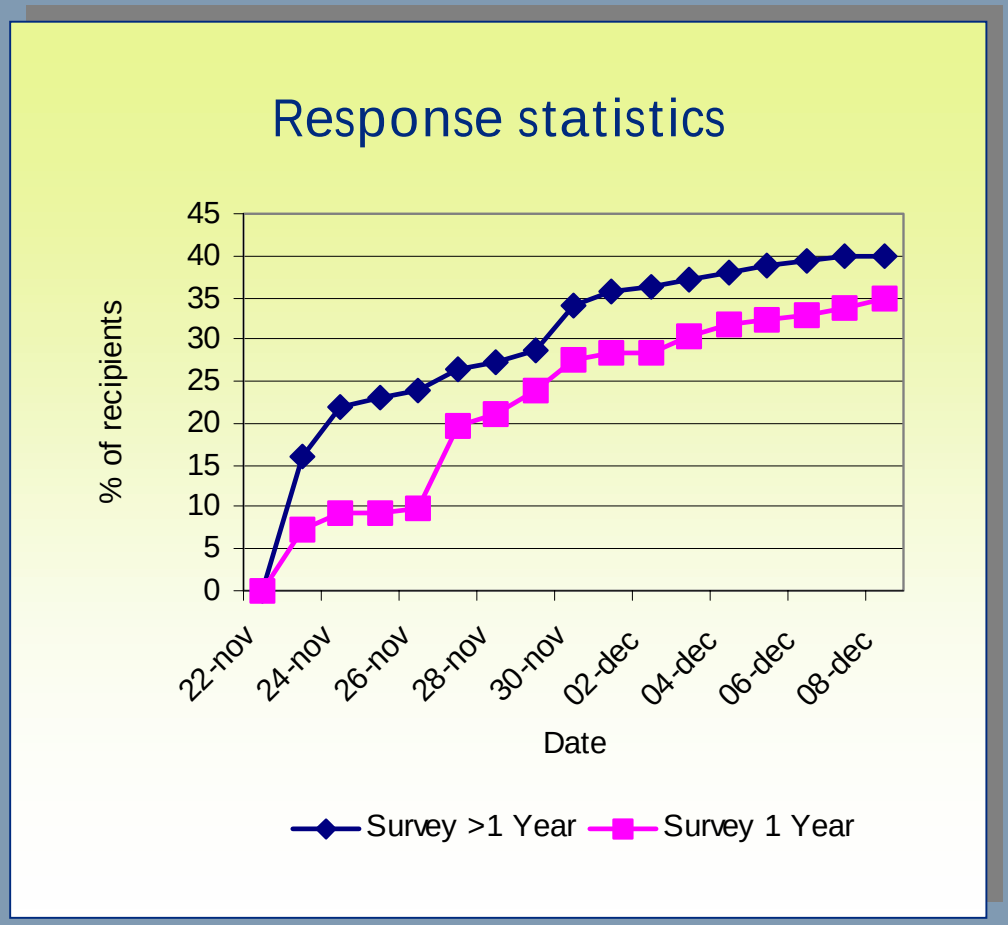
e-Survey: Future career expectations



Source: Survey of 1 year students

e-Survey response summary

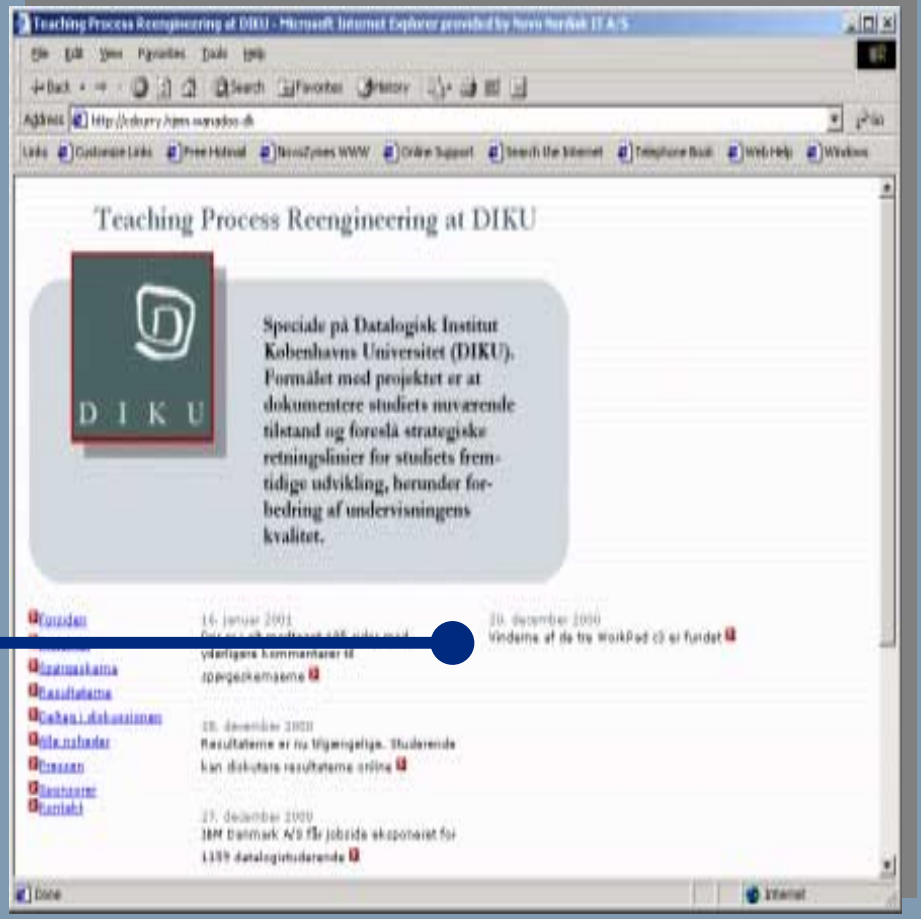
- **1 year students:** 71 respondents of 204 recipients **(35%).**
- **>1 year students:** 382 respondents of 955 recipients **(40%).**
- First year students start off slow.
- DIKU's e-mail list with >1 year students was not up to date.
- DIKU **does not** delete e-mail accounts of students, who graduate or end their studies prematurely.



e-Survey results web site

http://cdcurry.hjem.wanadoo.dk

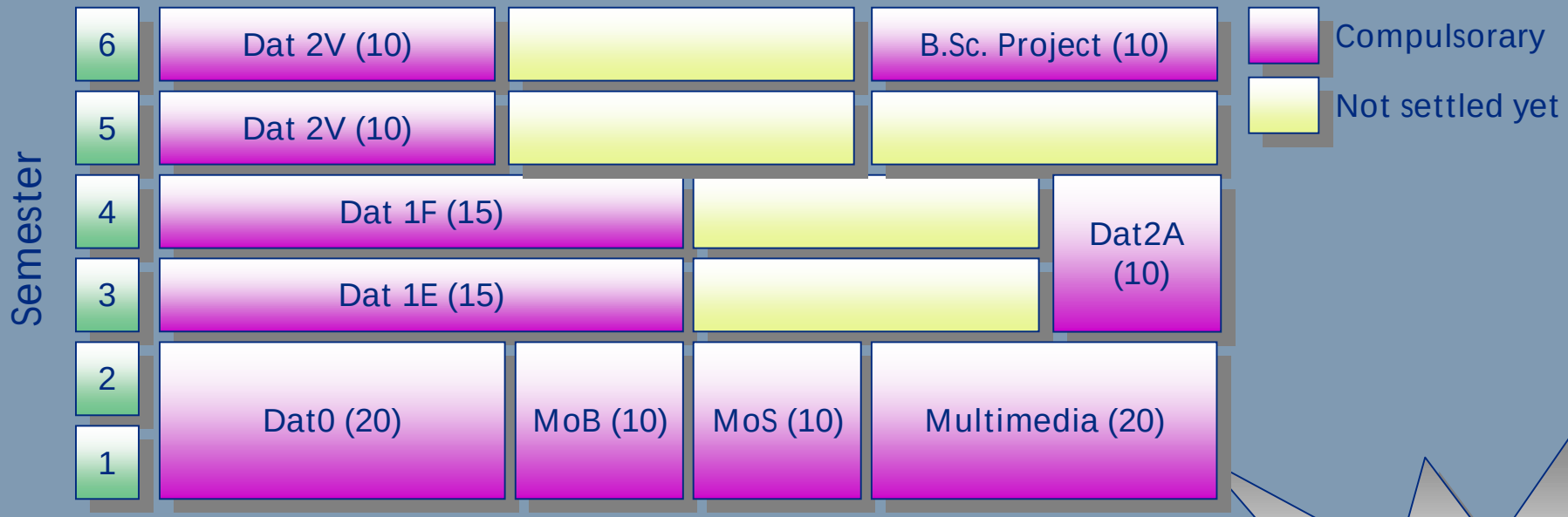
- Always communicate the results to the respondents as an acknowlegdement of their efforts.
- Provides DIKU students and teachers with
  - e-Survey results
  - e-Survey questionaires
  - News and FAQ.
  - Discussion forum
  - Single point of information
- **Proof of concept:** approximately 400 unique hits on the site within 4 days of launch.



Official plans by the staff-student board

- Full-time study program
- Master education

Full-time study in computing

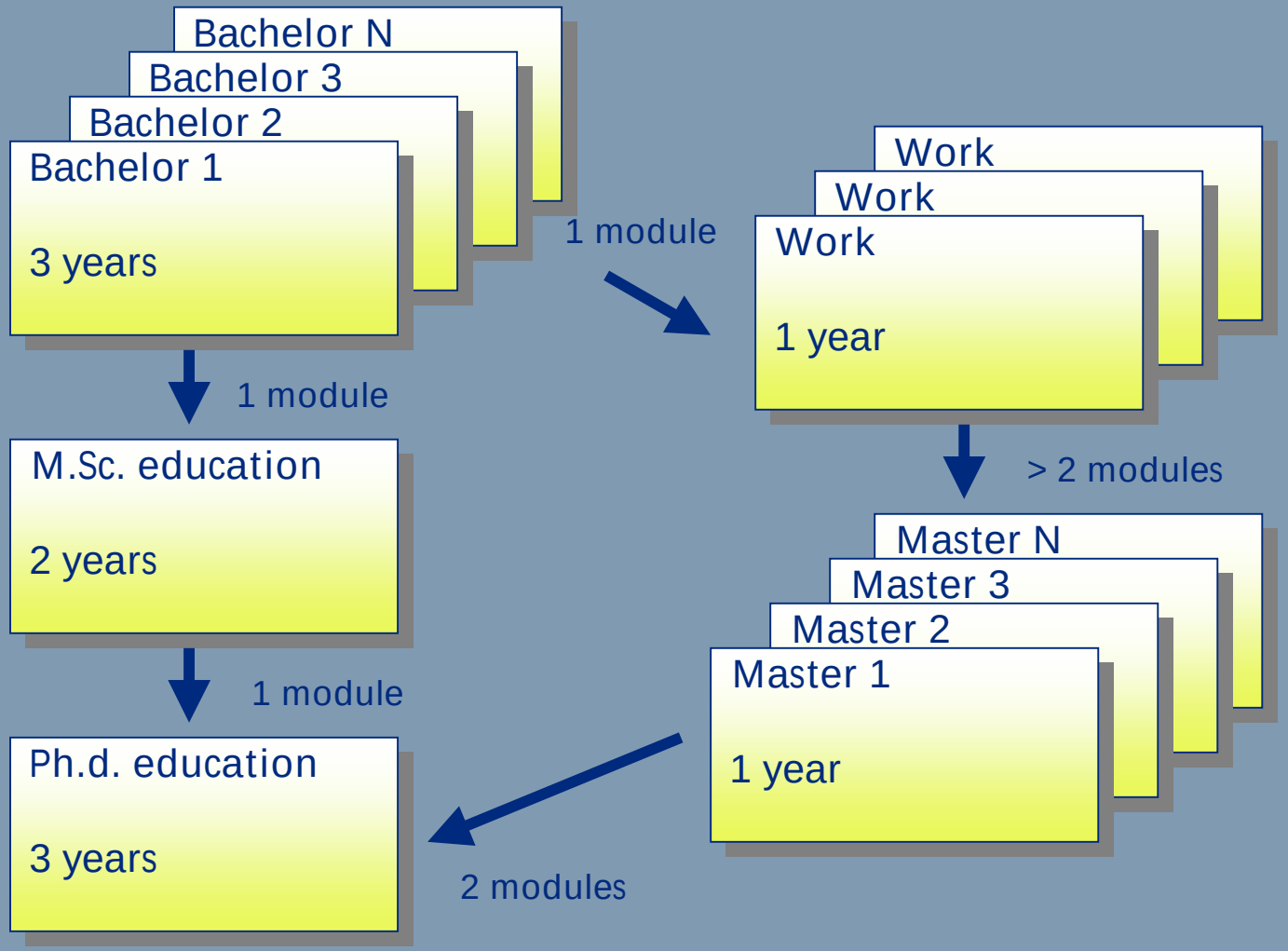


ECTS credits in brackets

Dat0	SML, Java, OO
MoB	Mathematics and Computation
MoS	Mathematics and Statistics
Dat1E	Compiler and CPU Architechture
DAT1F	Operating Systems and Networks
Dat2A	Algorithmics
Dat2V	Databases, Programming languages etc.

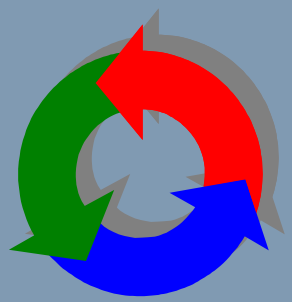
Study program commences from August 2001

Preliminary plans for future study structure



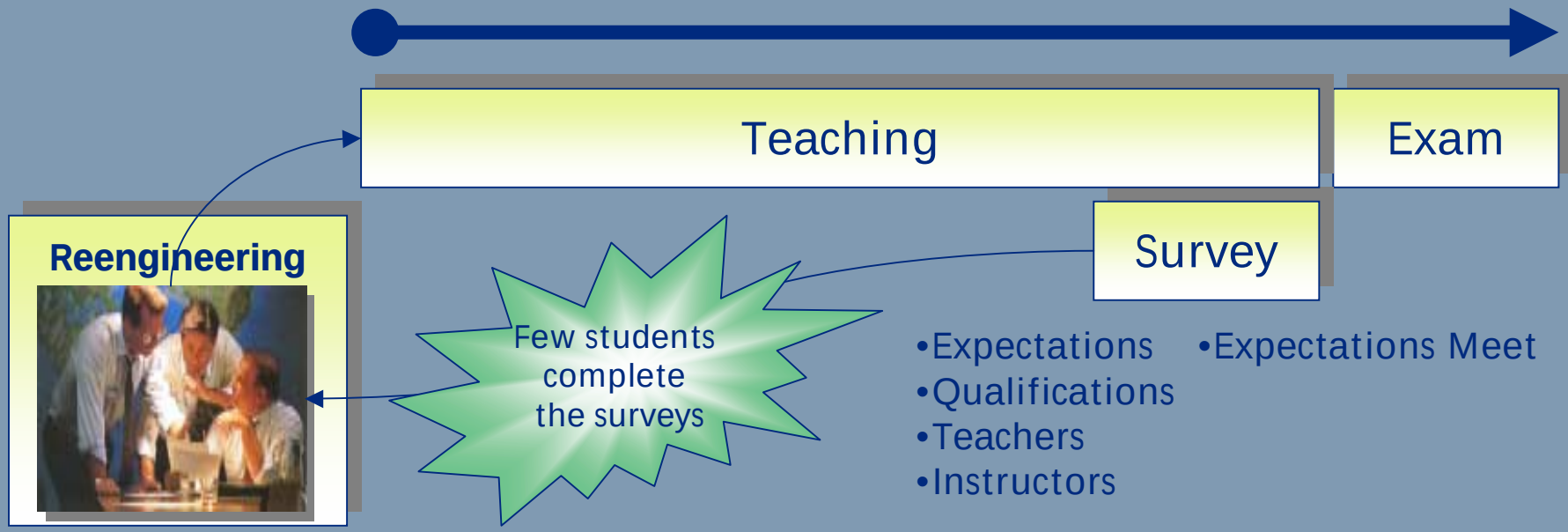
Our preliminary recommendations

- One time reengineering
  - Use of library
  - Introduction of DIKU to first year students
  - Introduction to software tools during the first semester
  - Project period at the end/middle of the course
- Continous reengineering
  - Course e-survey system
  - Collaborative project tool



Current course survey system at DIKU

Course life cycle

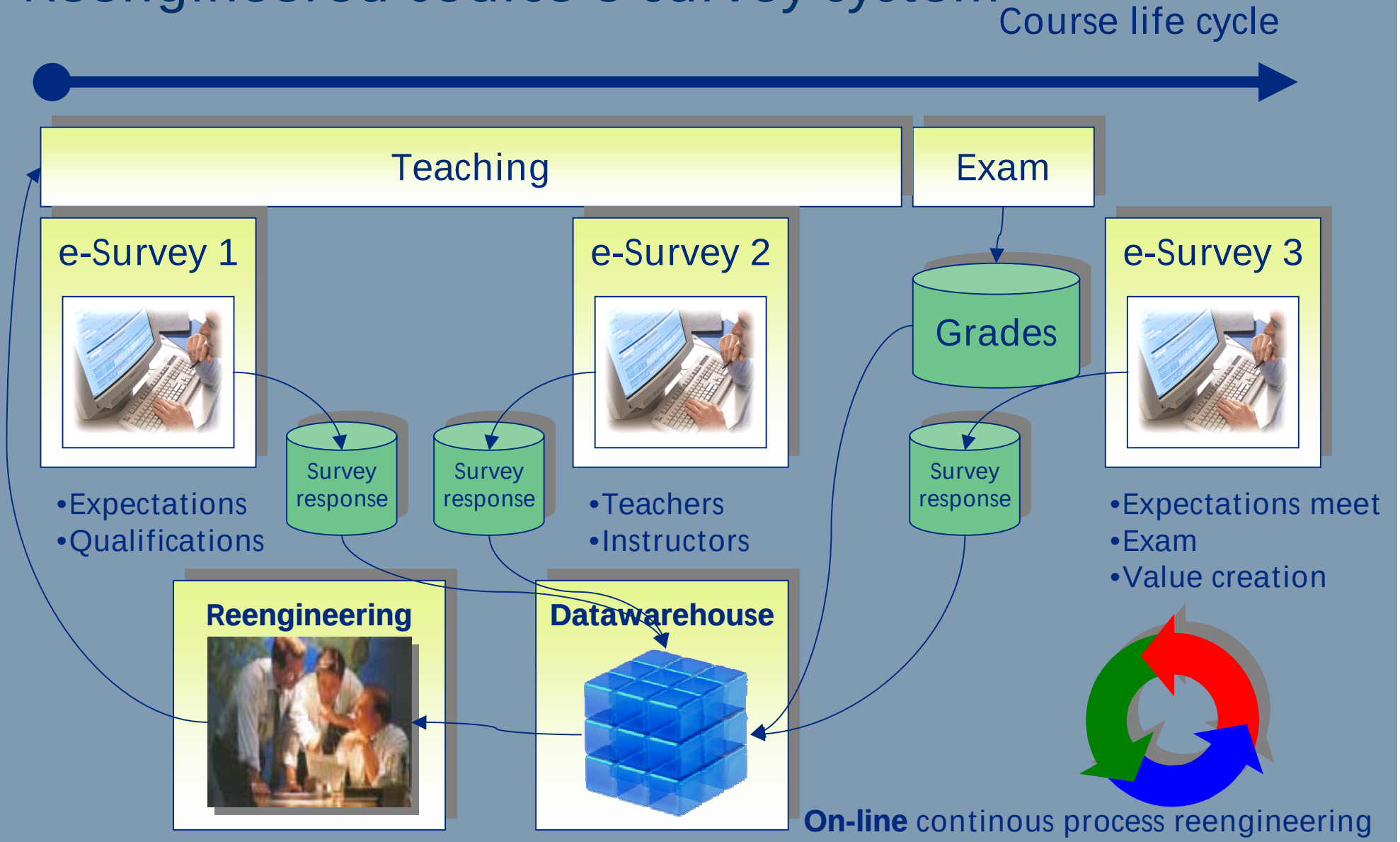


Why should I fill out this survey when the results and future improvements are not of value to me?

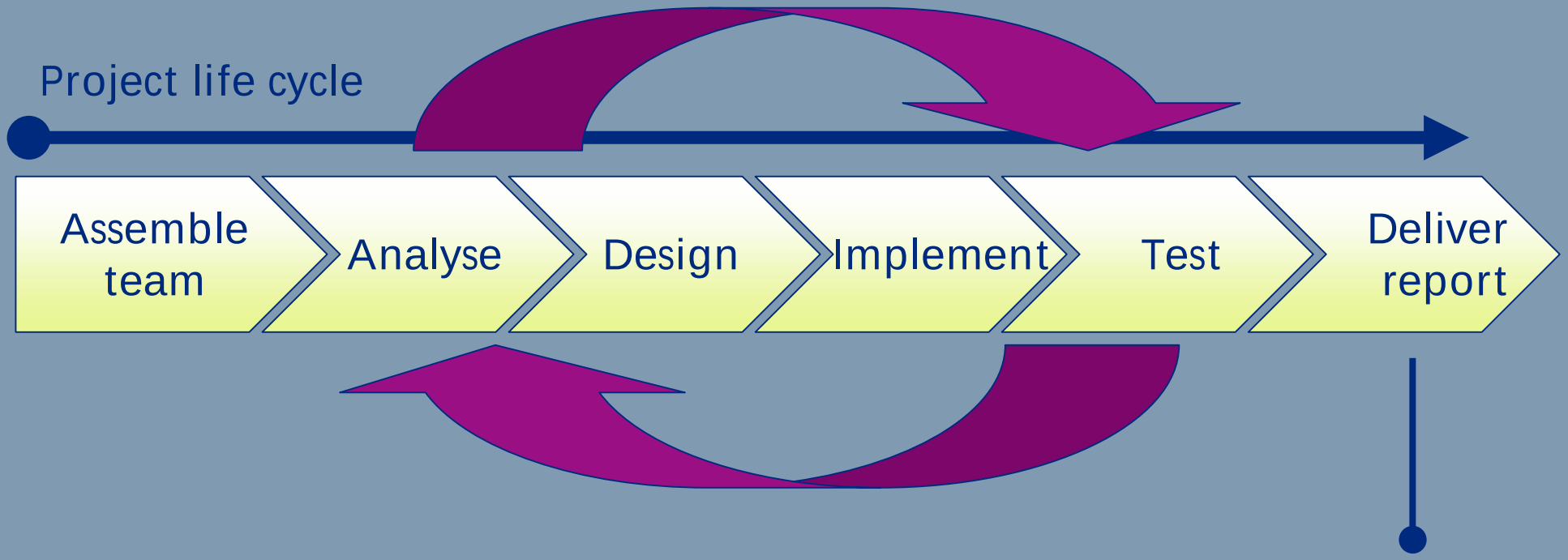
Did survey last year result in an improvement?

Did the students last year do this survey as well, did they in fact help us this year?

Reengineered course e-survey system



Current project process



Reengineered project process

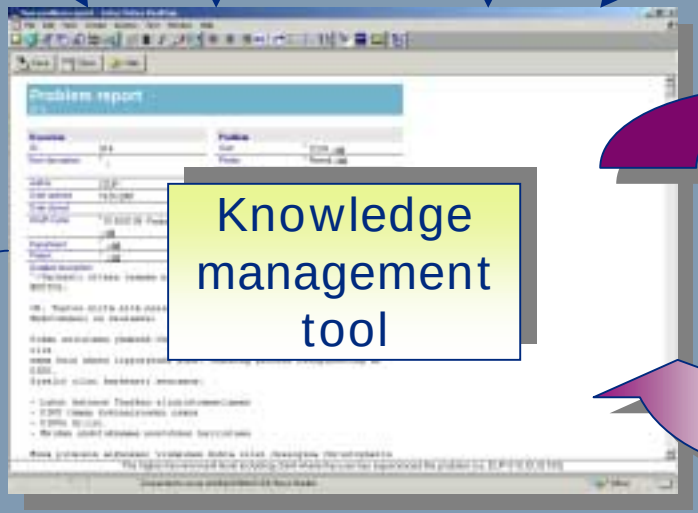
Collaborative project tool

Project life cycle

Assemble team → Analyse → Design → Implement → Test → Deliver executive summary

Max. 5 pages

Reengineering



Knowledge management tool

Repository

Instructor monitors progress and proactively assists team

Final remarks

- The reengineered processes must by supported by advanced IT systems.
- Reengineering one sub process does not add as much value as reengineering the whole system.

  Source: How to make reengineering really work, *The McKinsey Quarterly* (1994).
- We have to analyse approx. 185 pages of free text comments provided by the students, which requires vast amount of time.
- The recipient of our recommendation is DIKU management, and they have to decide further actions to be taken.
- The project is expected to be finalized Q4 2001.