# Teaching Process Reengineering at DIKU

**Tietojenkäsittelytieteen päivät**
May 21-22, 2001

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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**
- 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

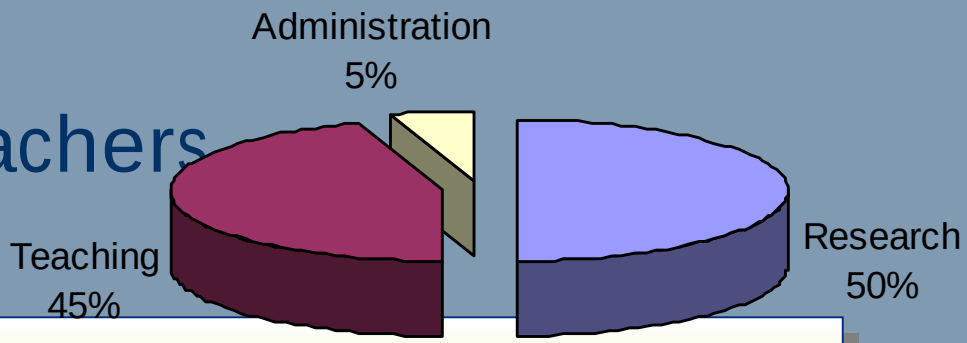
- The term *datalogi* comes from Peter Naur (see his letter to editor of the *Comm. ACM* **9**, 7 (1966), 485). Compare *tietologia, tietomatiikka, tietomaatti*.
- We are not mathematicians, not engineers, we are datalogists.
- Choose the subsidiary subject freely.
- Use of students independent work 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 | - |

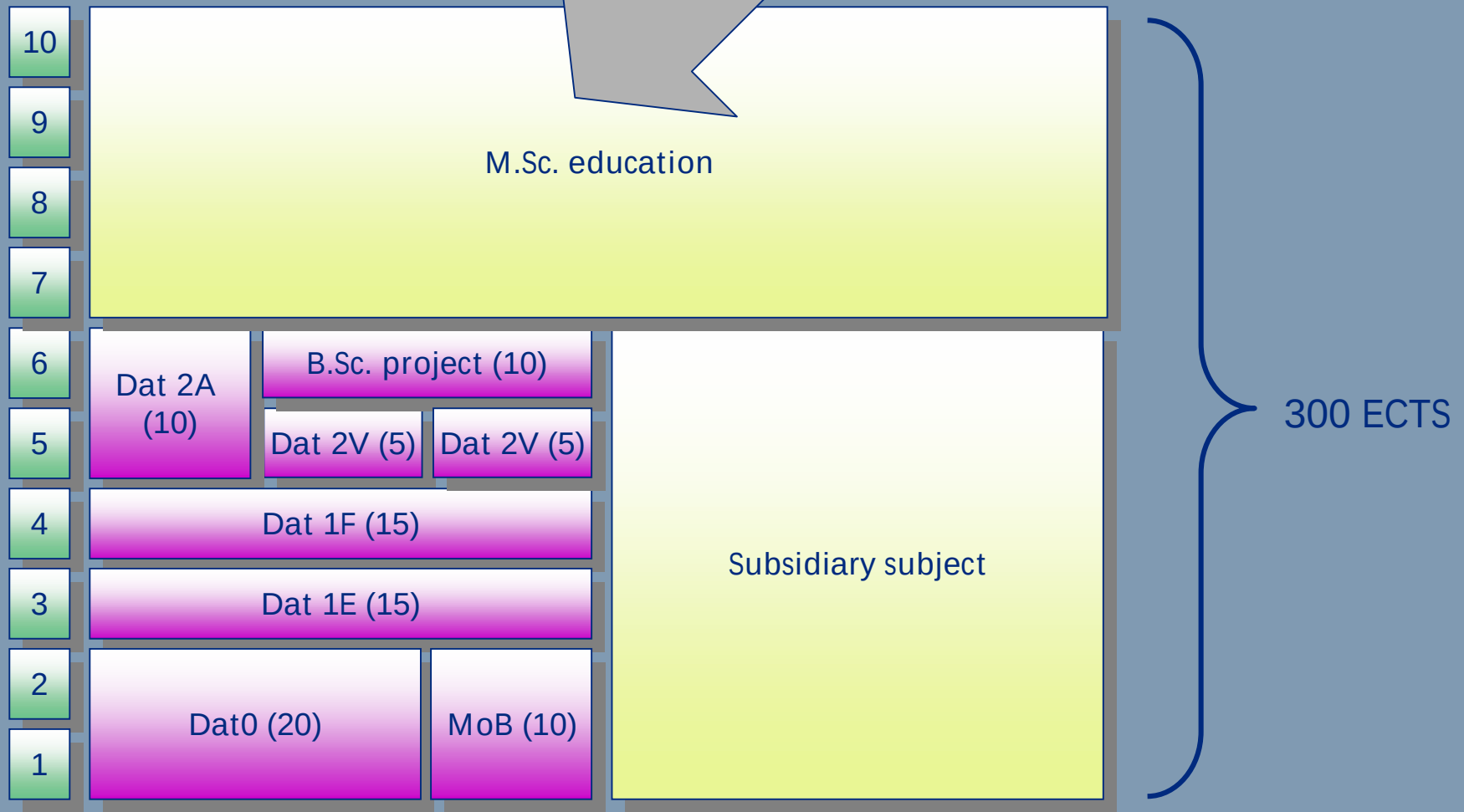
Exchange rate as of May 17: 100 FIM = 128.24 DKK

# Why students choose us?

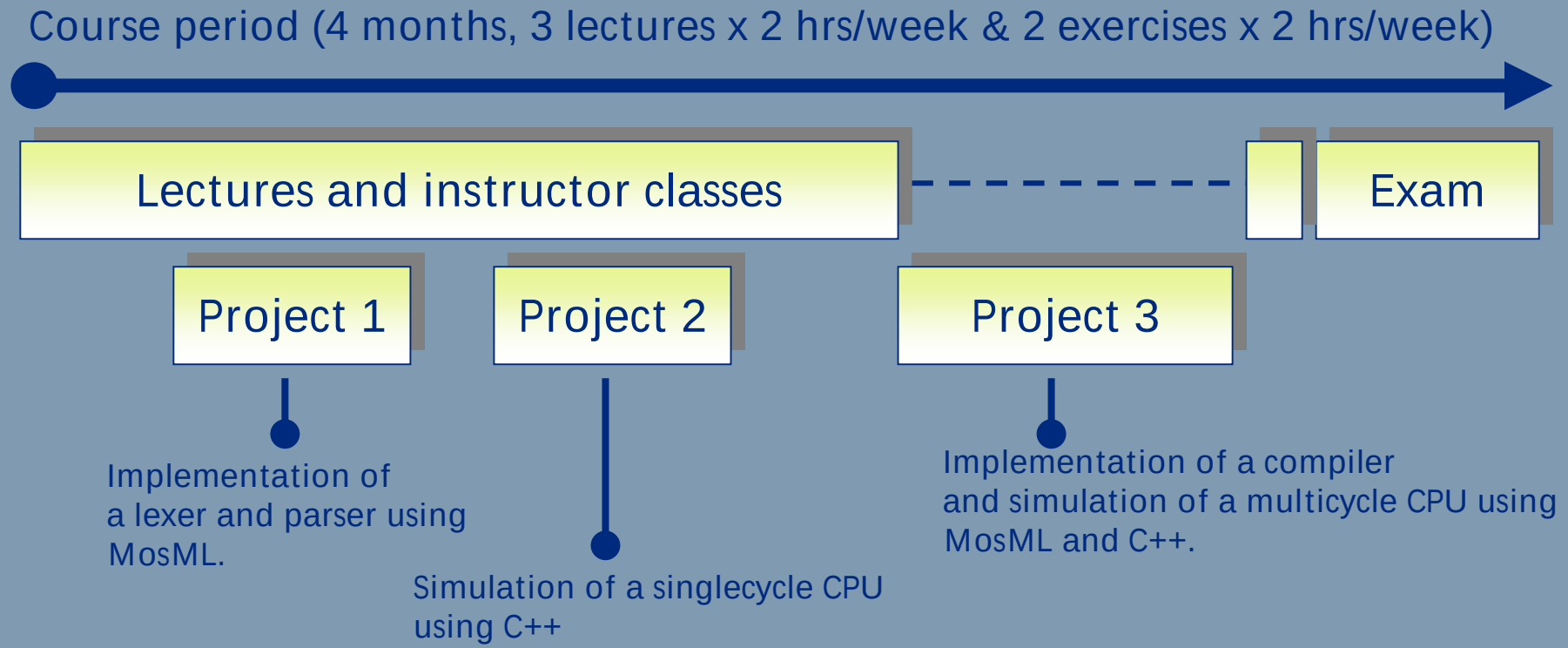
- Computers are the future.
- A dream I have had since childhood. I have been programming since I was 8.
- Computer science sounds interesting.
- DIKU offers a high quality education.
- DIKU is located in Copenhagen (not willing to move).
- Live in Copenhagen, friends live in Copenhagen.
- Random choice.
- 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

Budget cuts

Loss of qualified faculty members

Difficult to get qualified instructors

High drop-out rate

Critics from former students:

- No visions
- Old fashioned

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# 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

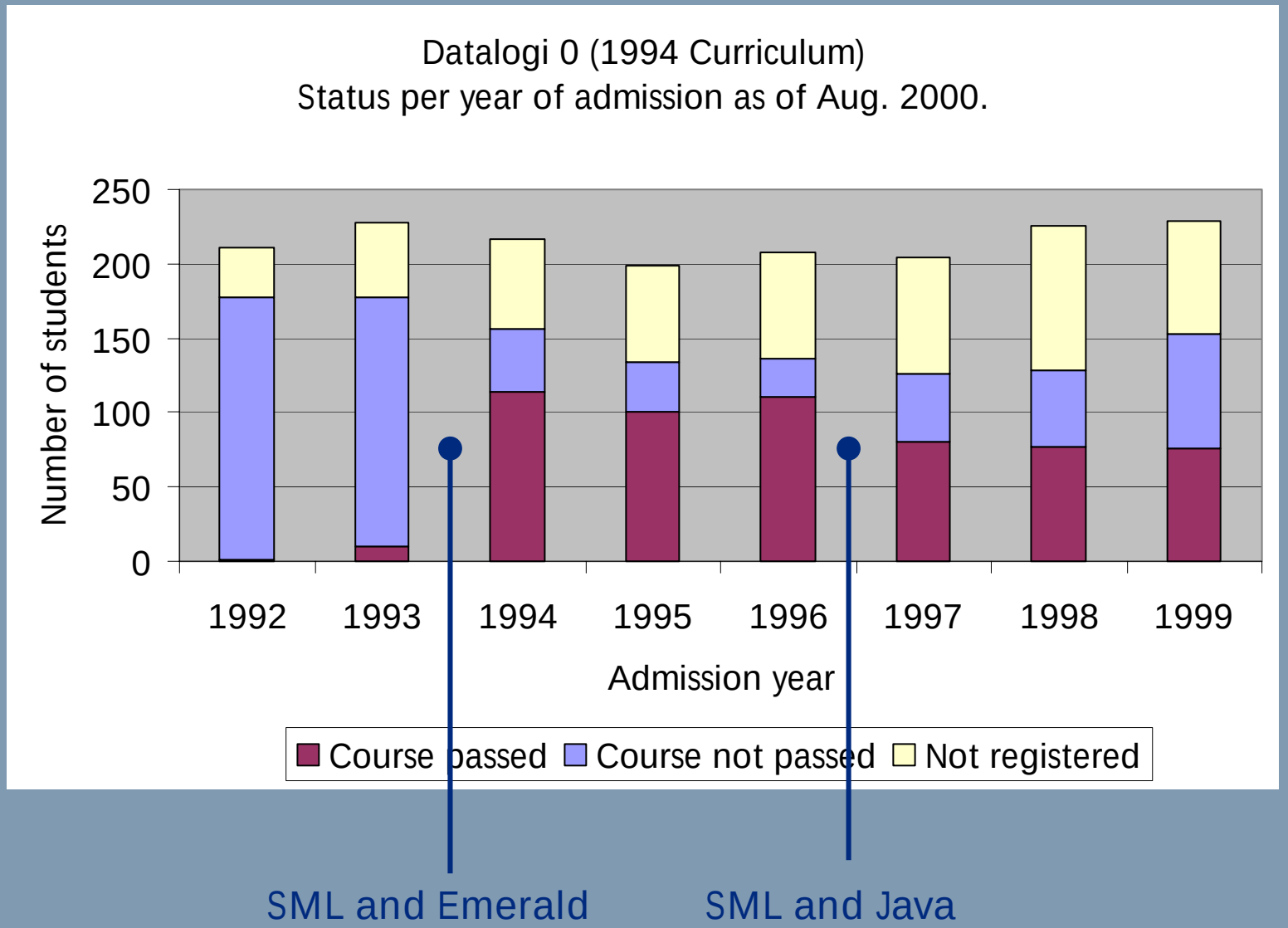
Analysis

e-Survey

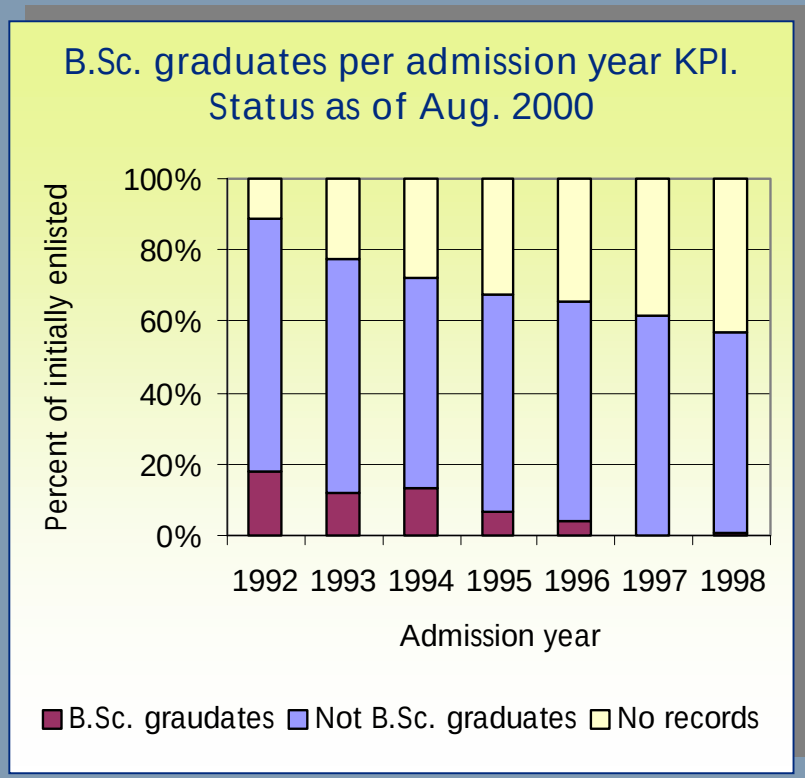
Interviews

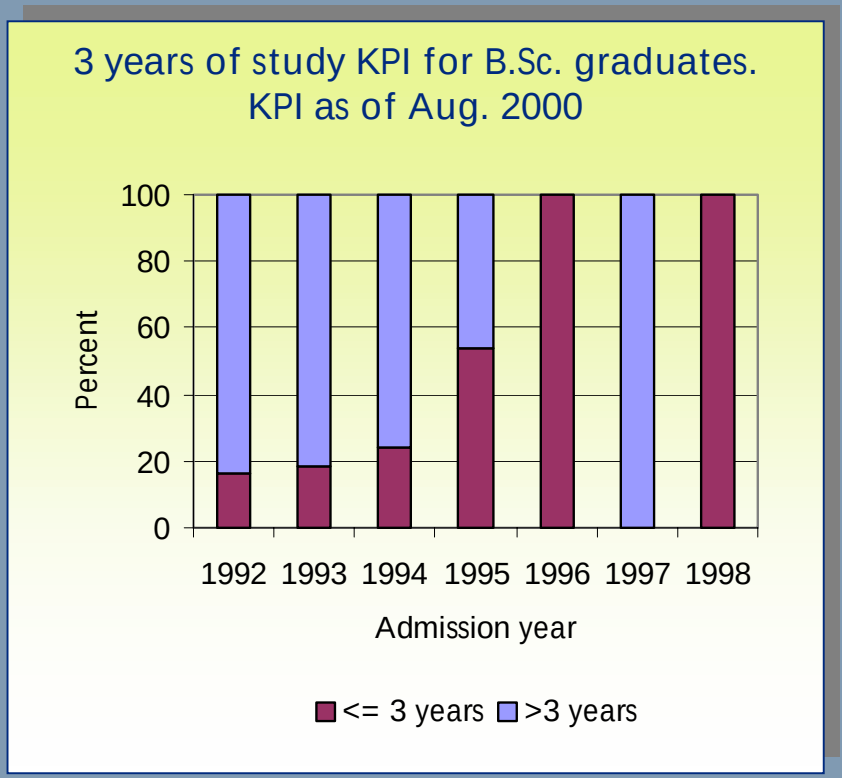
Key Performance Indicators

# Status on first year exam



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



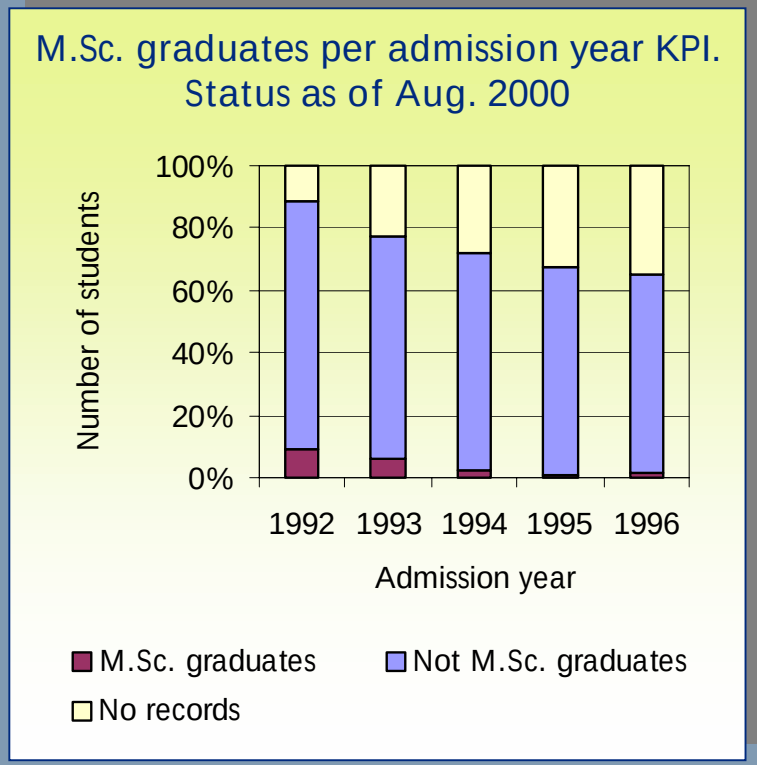



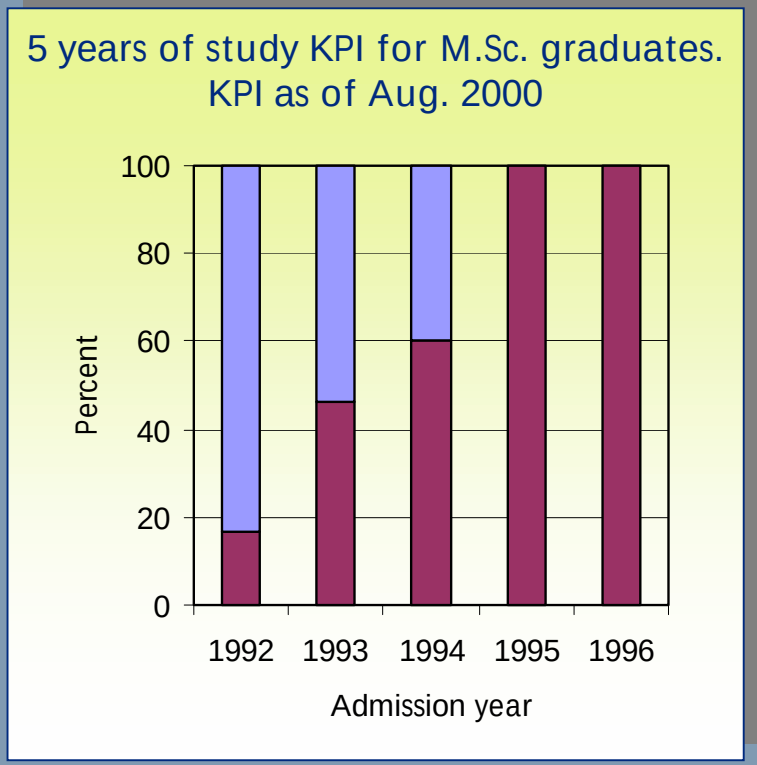
# B.Sc. educations: Completion and drop-out (1998)

| 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



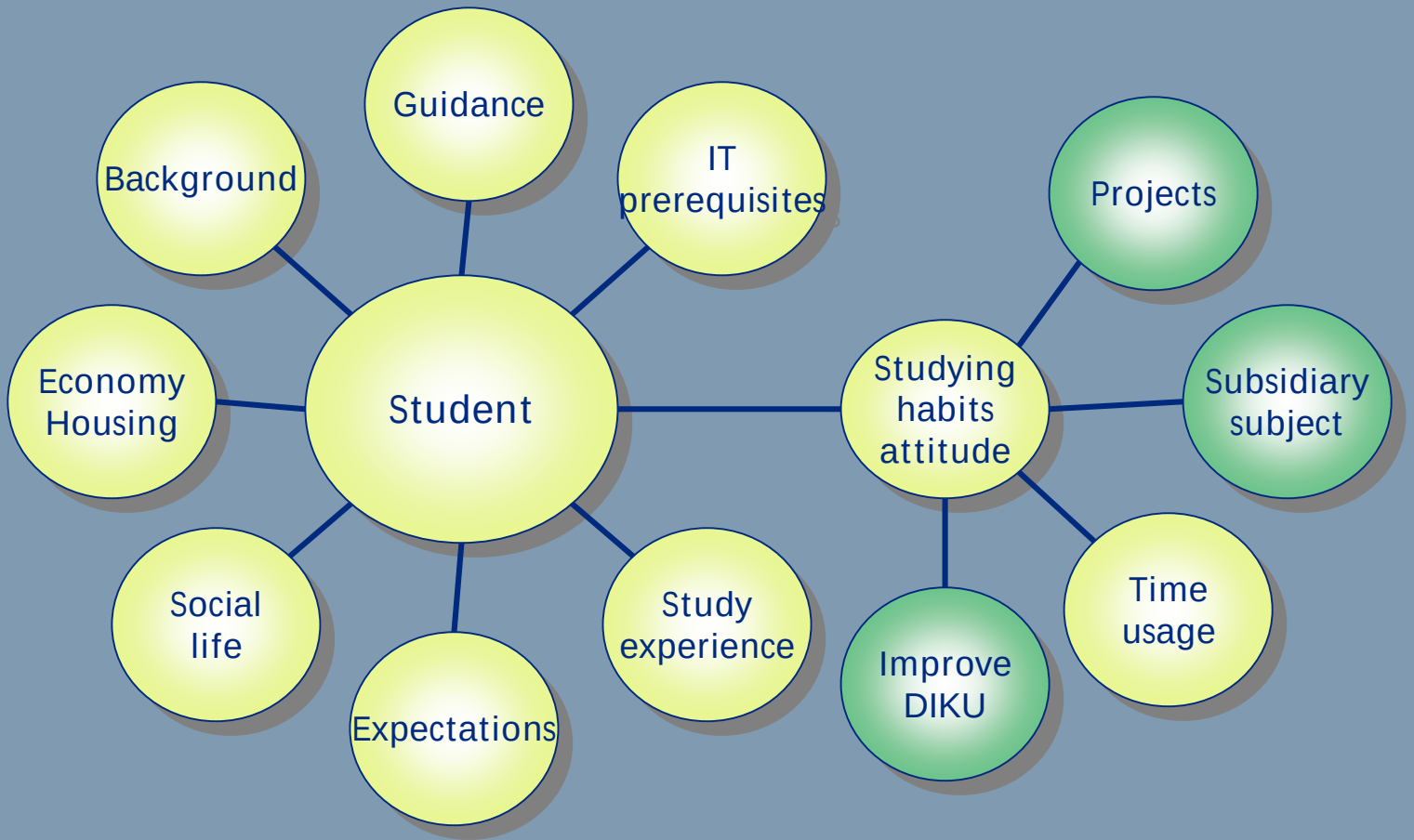
# M.Sc. Educations: Completion and drop-out (1998)

| 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 |

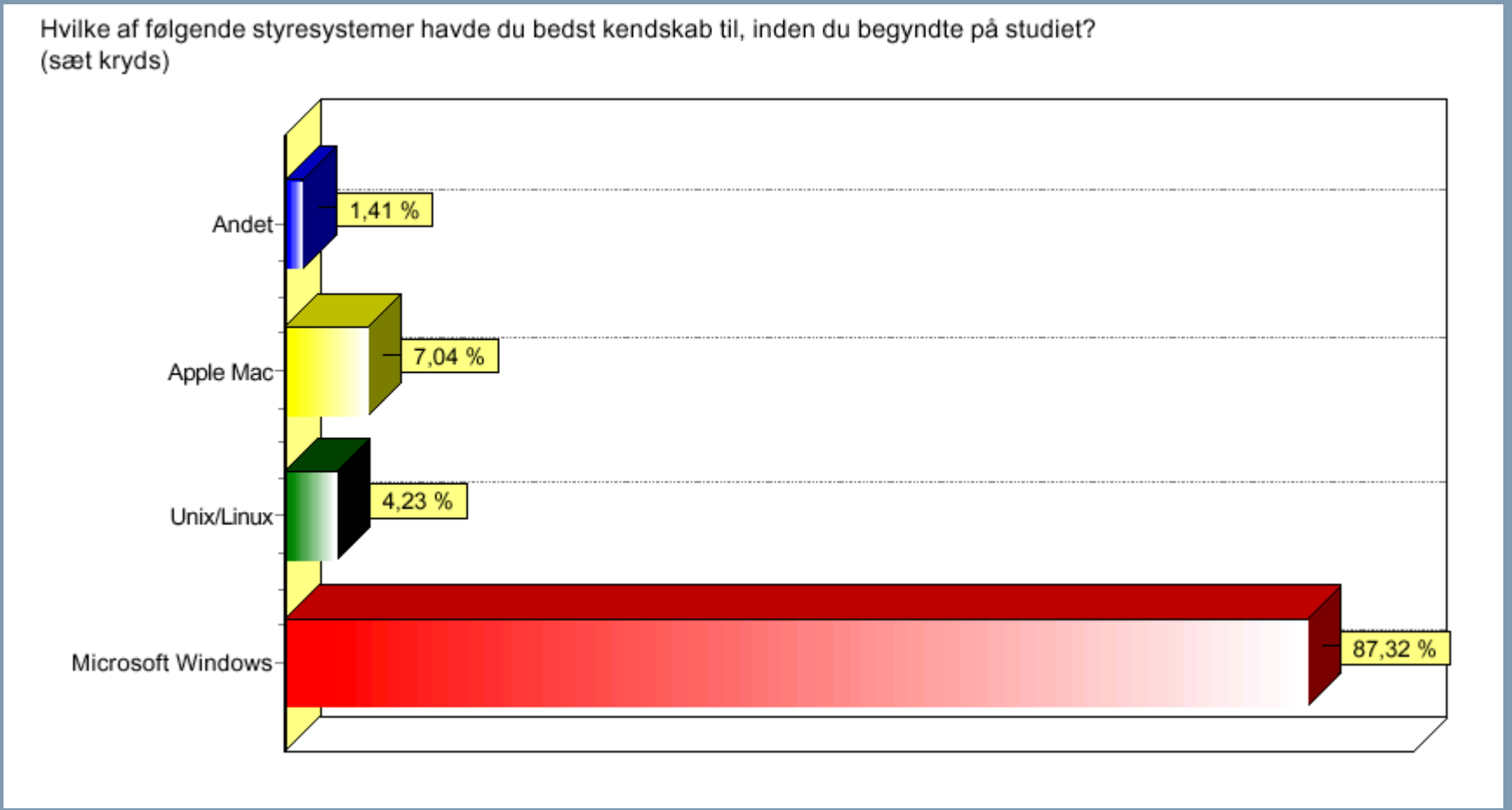
Source: Ministry of Education, www.uvm.dk

# e-Survey objectives

What do you know about your students?

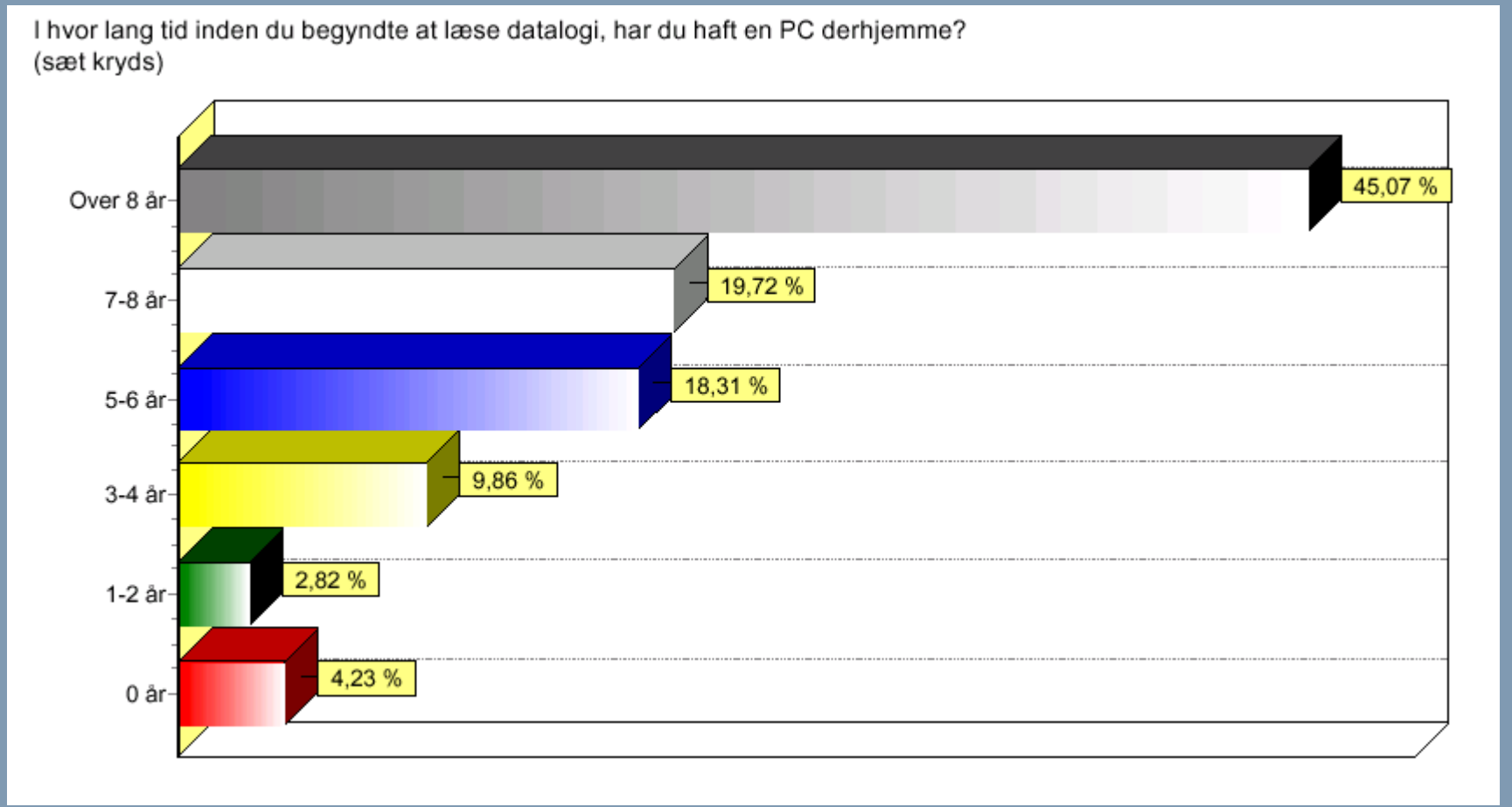


# e-Survey: IT prerequisites



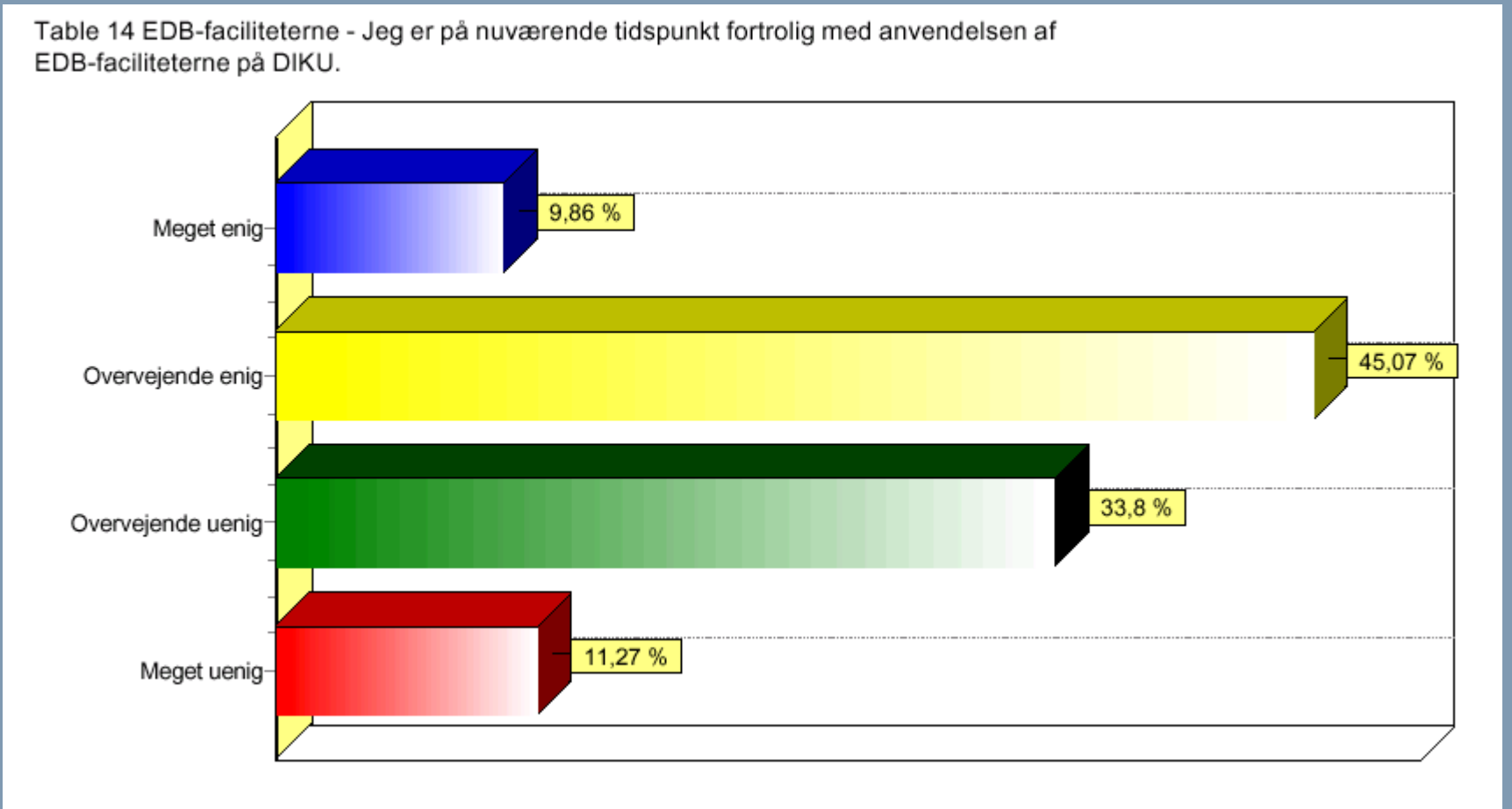

Source: Survey of first year students

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



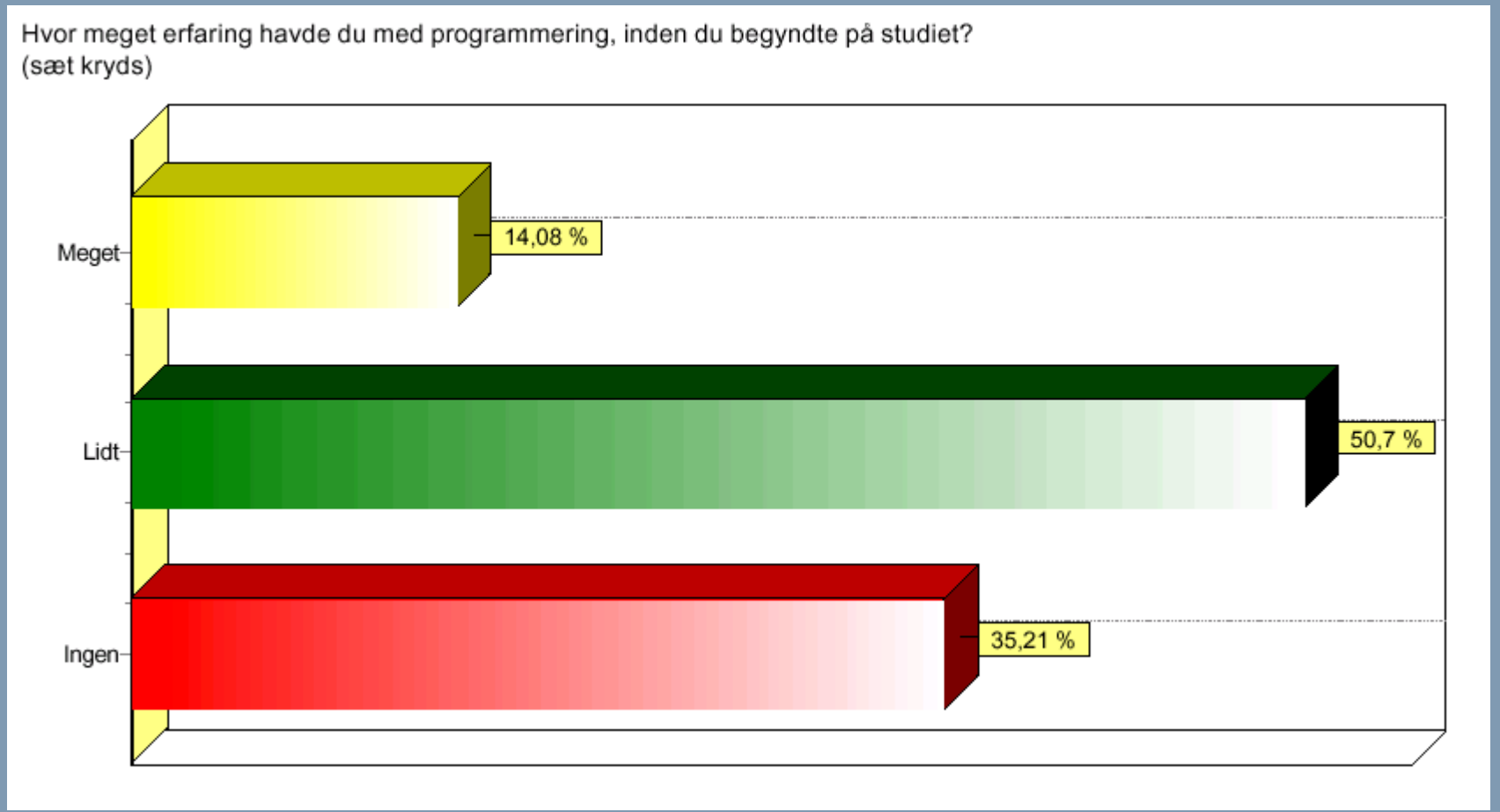

Source: Survey of first year students

# e-Survey: Familiarity with DIKU's IT systems



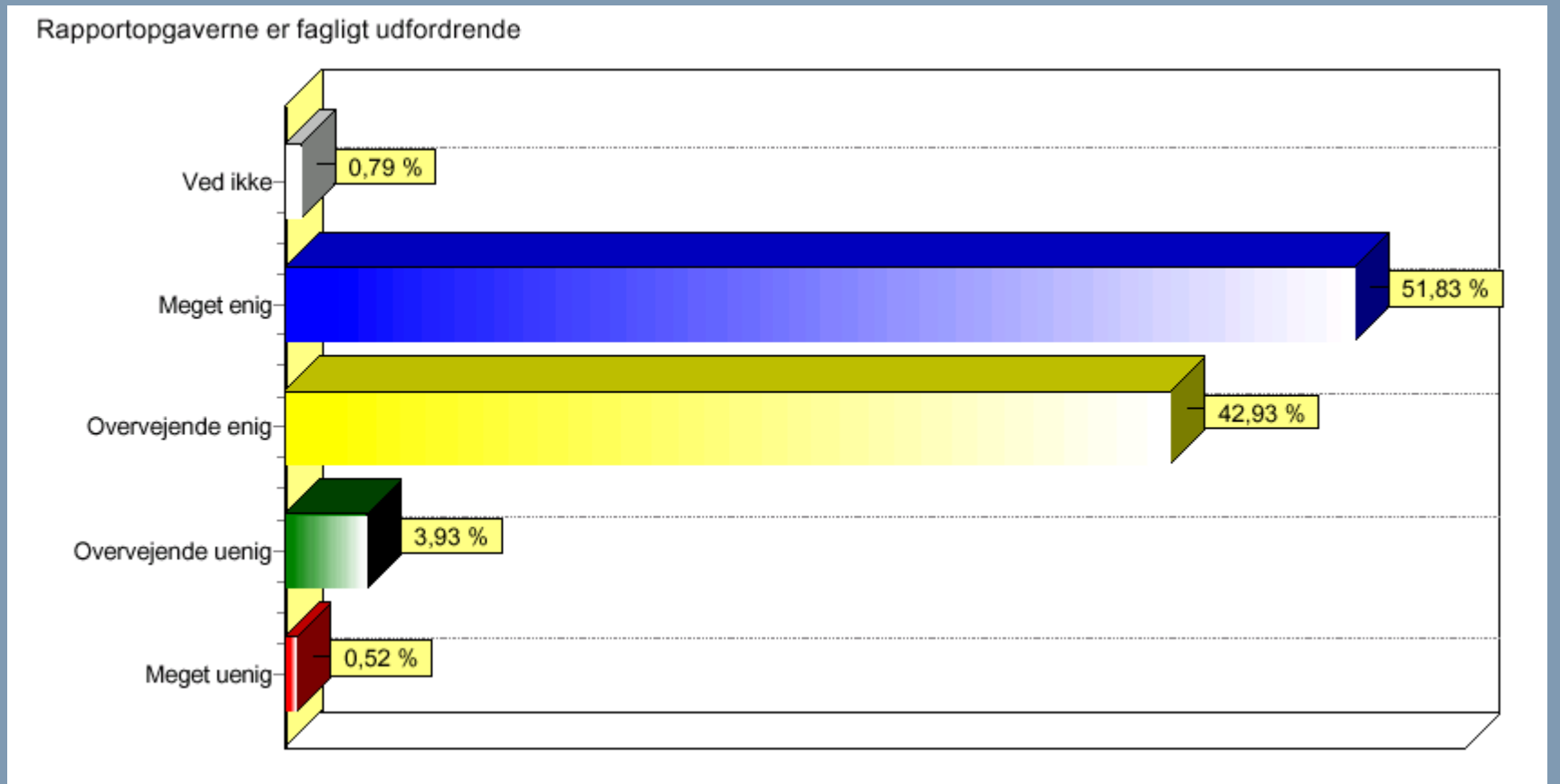

Source: Survey of first year students

# e-Survey: Programming experience



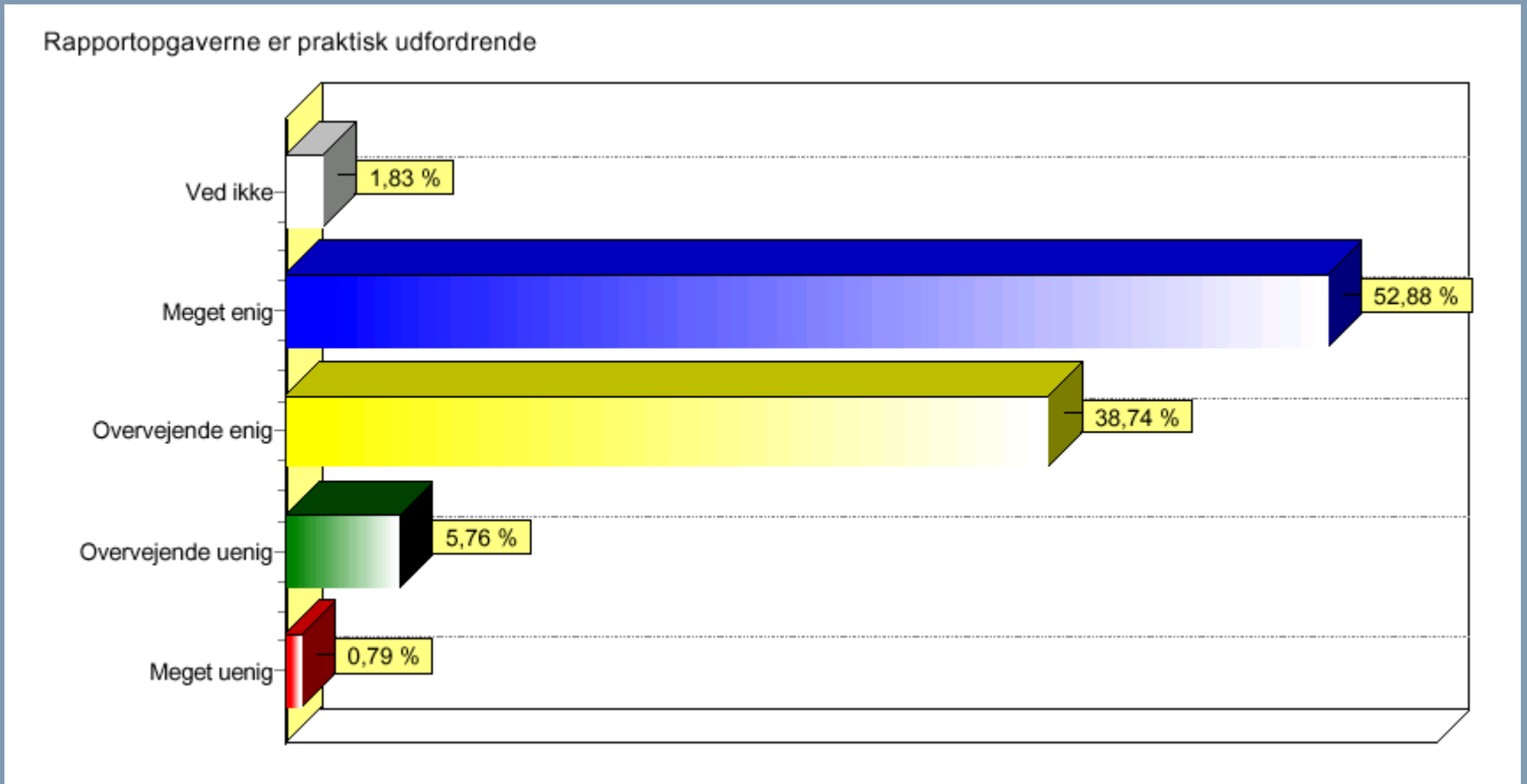

Source: Survey of first year students

# e-Survey: Our the projects are scientifically challenging



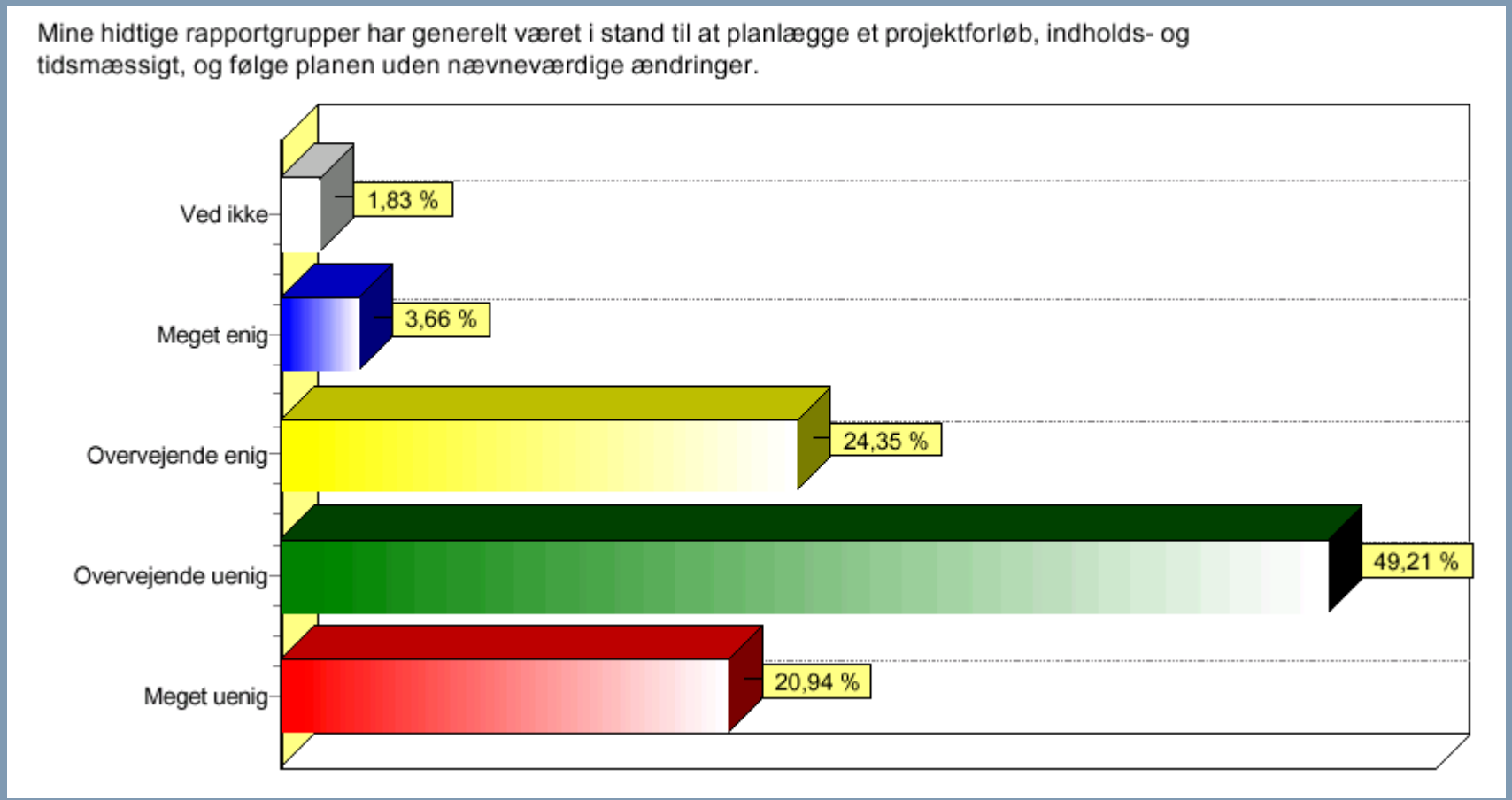

Source: Survey of >1 year students

# e-Survey: Our projects are practically challenging



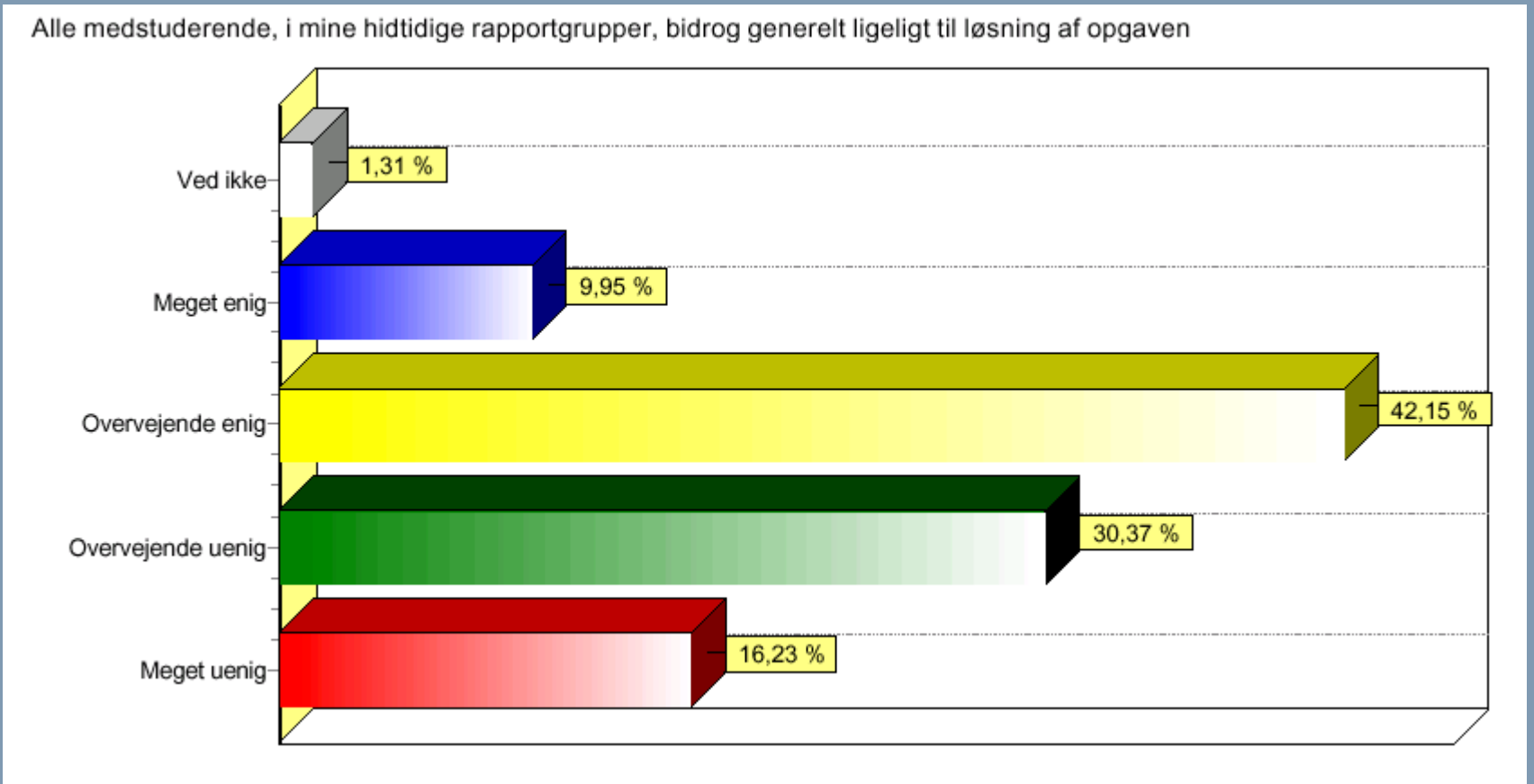

Source: Survey of >1 year students

# e-Survey: You plan ahead and keep deadline



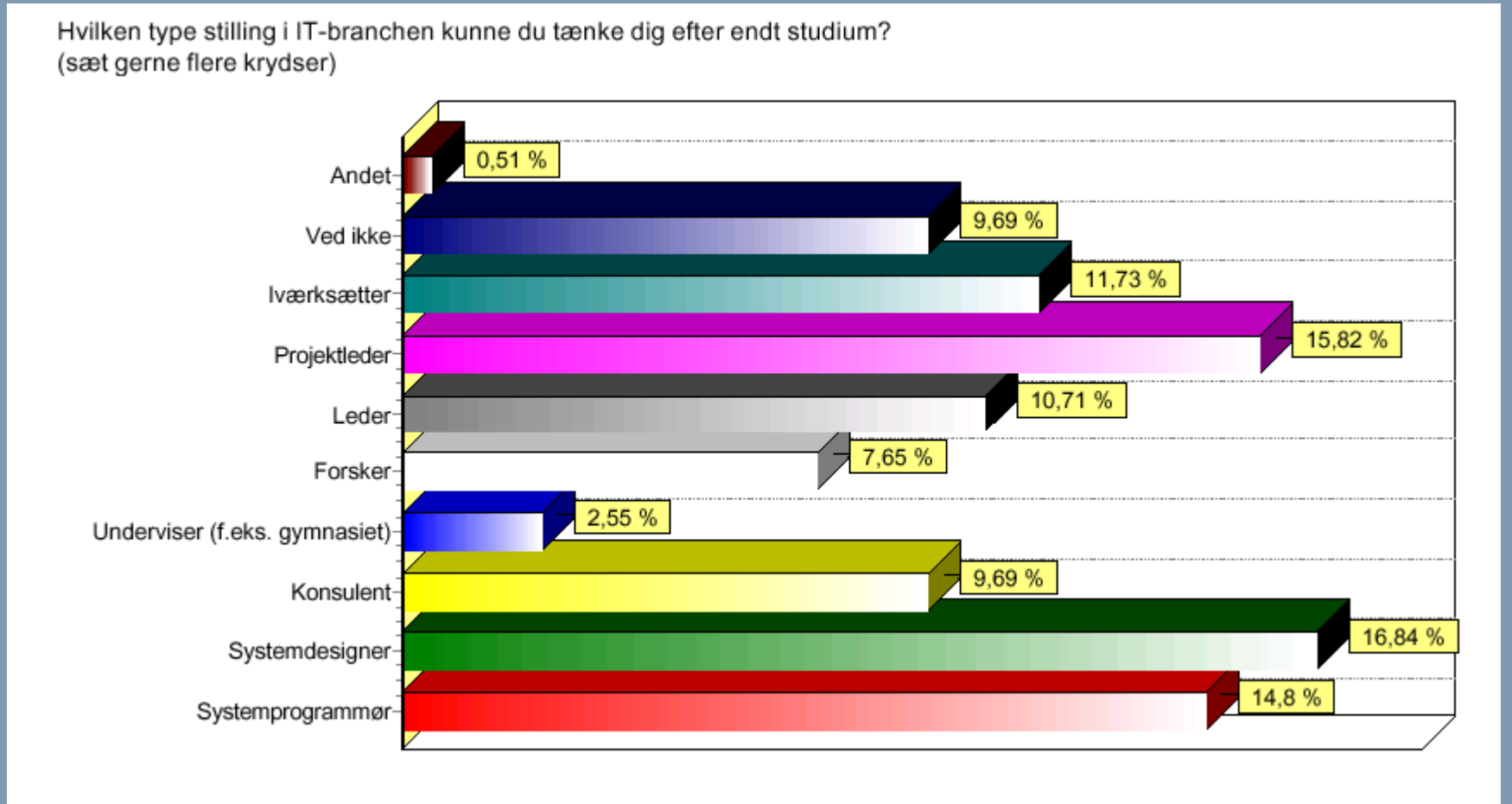

Source: Survey of >1 year students

# e-Survey: All team members contribute equally




Source: Survey of >1 year students

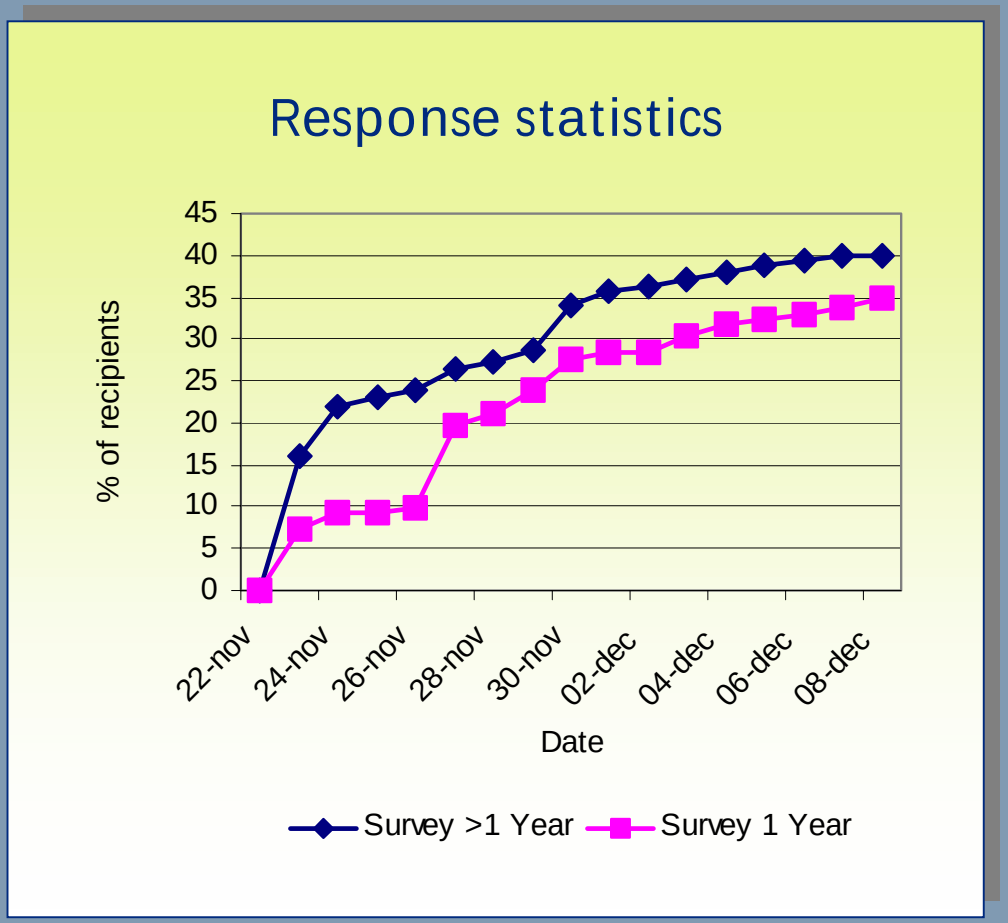
# e-Survey: Future career expectations




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

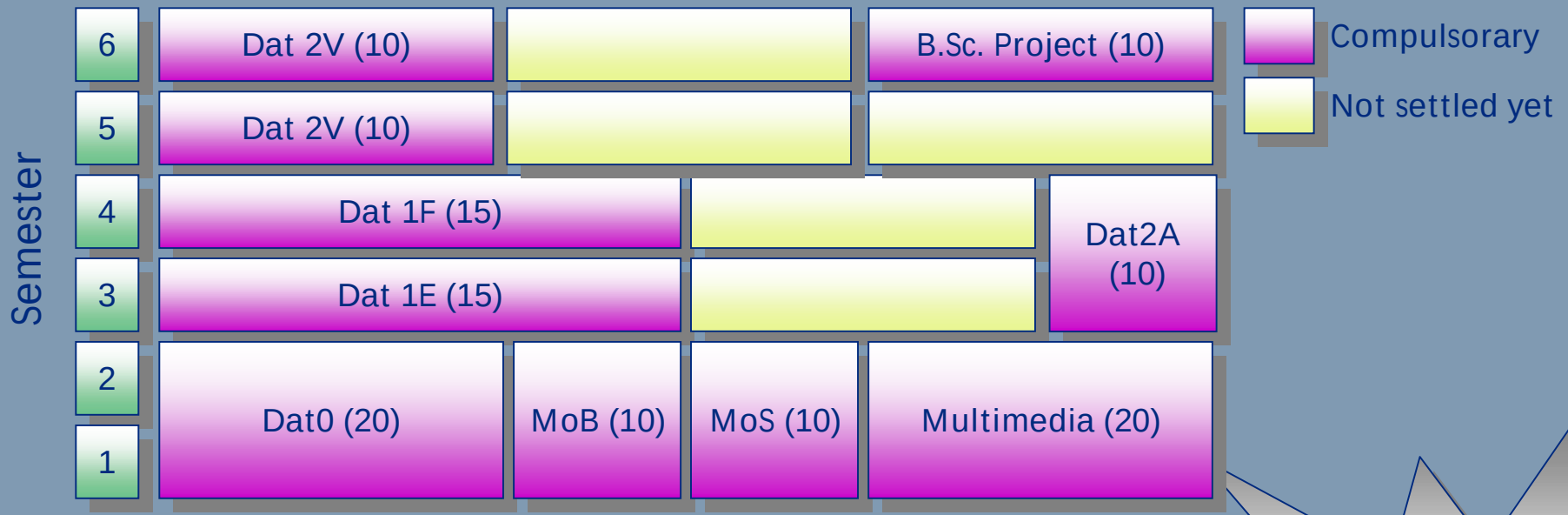
http://cdcurry.hjem.wanadoo.dk

- 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

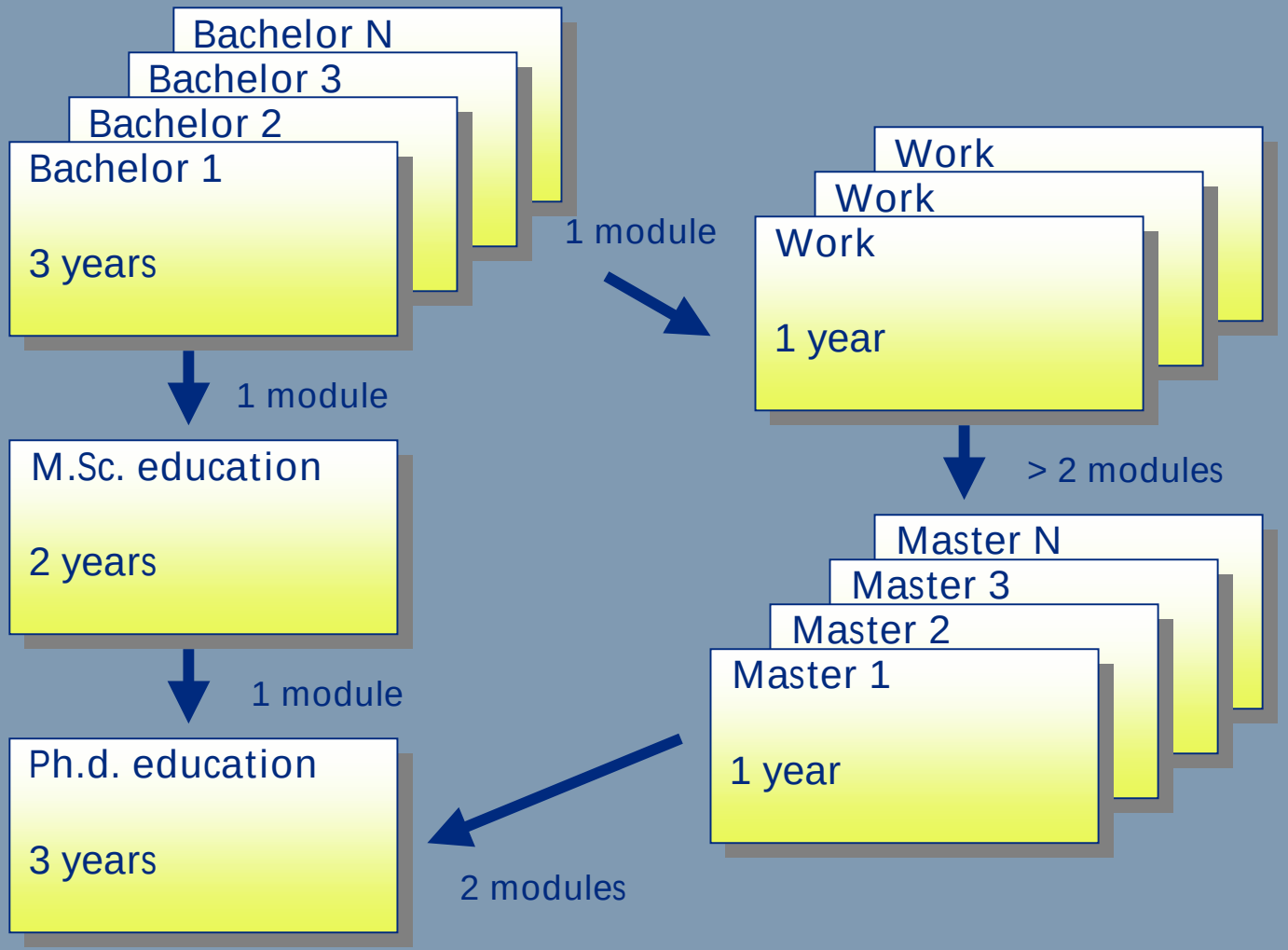



ECTS credits in brackets

| | |
|---|---|
| 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. |

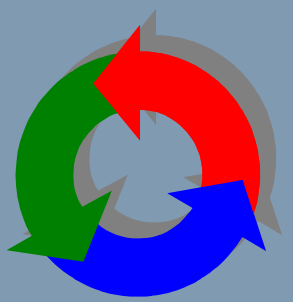
Study program commences from August 2001

# 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

Teaching

Exam

Survey

**Reengineering**

Few students complete the surveys

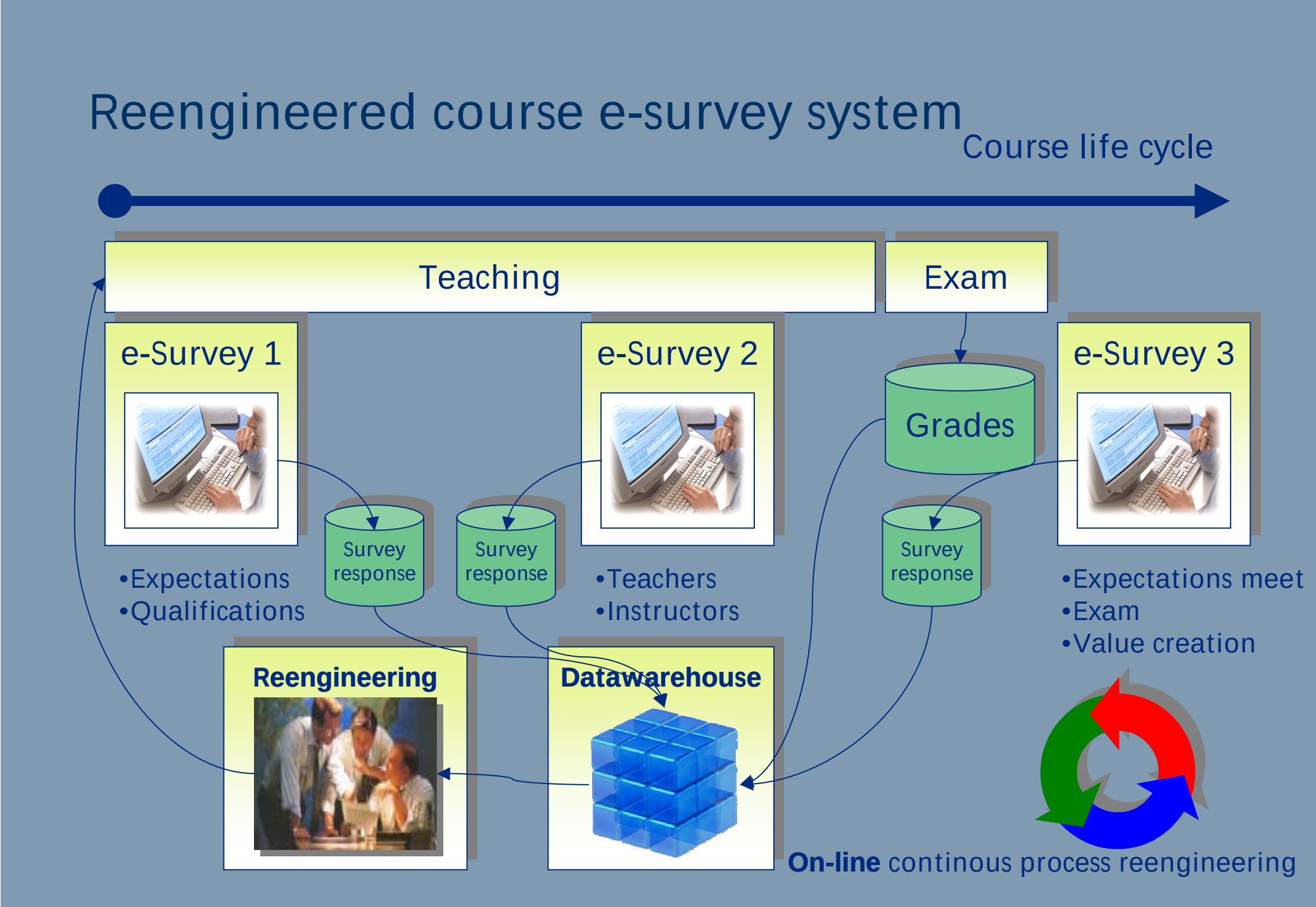
- Expectations
- Qualifications
- Teachers
- Instructors
- Expectations Meet

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



# Key incentives for submitting the survey

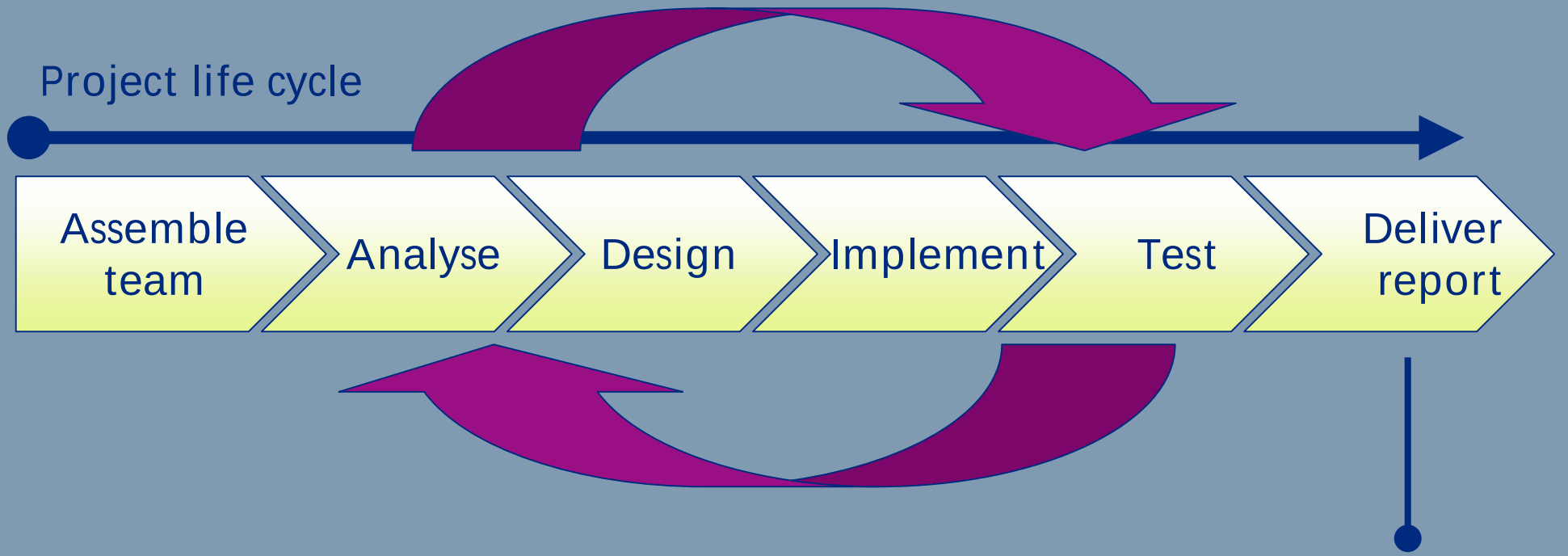
## Current process

- Improve course knowing that next years students will benefit.
- **Basically none!**

## Reengineered process

- **Survey is integrated part of the course** and it is required for each student to participate in order to pass the course.
- **The students benefit** as results from e-Survey 1 and 2 are used to manage course **now** and not in the future.
- Students know that DIKU is required to take action.
- **e-Survey is easy to use!**

# 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.