ENGINEERING 5

Lecture 9: Final Project, Learning Styles, Teamwork, Ethics

Professor Erik Cheever

Course web page:
http://www.swarthmore.edu/NatSci/echeeve1/Class/e5/E5Index.html

Remember…

- Thursday 11/5: Last MatLab assignment is due
- Thursday 11/12: Demo robot arm.
- Tues 11/17: Project Proposal is due (on wiki)
- Thursday 11/19: Robot arm wiki is due.

- Wizards: Tuesday 11/3, 8:00-10:00 p.m & Wednesday 11/4, 7:00-10:00 p.m **Hicks 213!** Don't wait until the last minute!
- Start thinking about your project (last 3 weeks of class). Some ideas are at "Projects" link on left side of course web page page (including last year's projects).
- You need to have a project selected by Thurs 11/12.
- ASME meeting tomorrow (11/4) at 9:30 in Hicks 208

The big picture…

- Today:
  - Project Proposal Preparation (Proper preparation prevents poor performance)
  - Learning styles
  - Teamwork
  - Ethics
- Next 1+ weeks: design, build, and program both a simulation and a physical robotic arm.
- Final 3 weeks: project

Final Project

Project

- Group or individual
- Groups can be up to 4 people – not necessarily from your lab section
- Project can be anything you think you can do in 3 weeks (10-20 hours).
- If you need extra supplies (up to about $40) let me know by Monday (11/16) so we can order.

- Wiki with project name and team members must be started by Thursday 11/12 (started on wiki before you come to lab).
- Project proposal is due on wiki by Tuesday 11/17

- Sunday 12/6 Practice Presentation
- Tuesday 12/8 – Oral presentation for class
- Thursday 12/10 – Project writeup on wiki is due.

Project Proposal (Written)

- Written proposal
- Due on wiki on 11/17
- Include:
  - Motivation for project
  - Description of project, including block diagram with major components (software and/or hardware)
  - Time line
  - Any equipment required

Project Writeup

- Projects will be on Wiki, started by 11/17
- Oral Project Presentation on 12/8 during lab period (5-10 minutes). Practice Presentation on Sunday 12/6.
- Project Wiki completed by 12/10

Learning Styles

Learning Styles

- Everybody learns in a different way.
- Learning style index, similar to Myers-Briggs personality type index (Extrovert-Introvert, Sensing-Intuition, Thinking-Feeling, Judging-Perceiving).
- Learning styles (Active-Reflective, Sensing-Intuitive, Visual-Verbal, Sequential-Global).
- Exact “axes” aren’t important, but being aware of the way you learn can be very important.

Information on learning styles taken from: http://www4.ncsu.edu/unity/lockers/users/f/felder/public/ILSdir/styles.htm

Active vs. Reflective (Description)

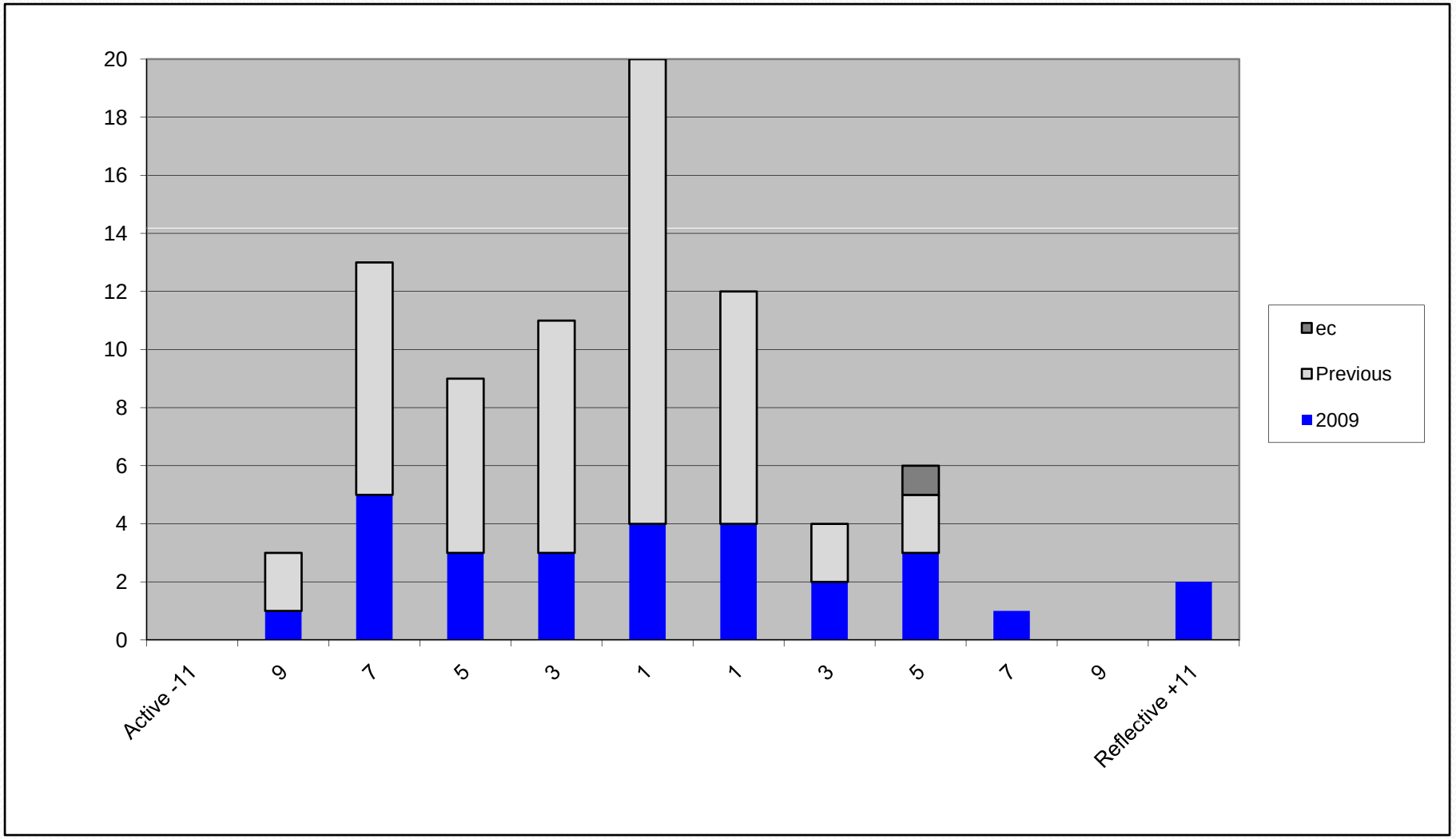
Active	Reflective
Retain information best by doing something active.	Prefer to think about it quietly first.
"Let's try it out and see how it works"	"Let's think it through first"
Group work	Working alone

Active vs. Reflective (Strategies)

Active	Reflective
Study in a group.	Stop periodically to review what you have read and think of possible questions or applications.
Quiz each other	Write short summaries of readings or class notes in your own words.

Active vs. Reflective

Average = -1.6



Sensing vs. Intuitive (Description)

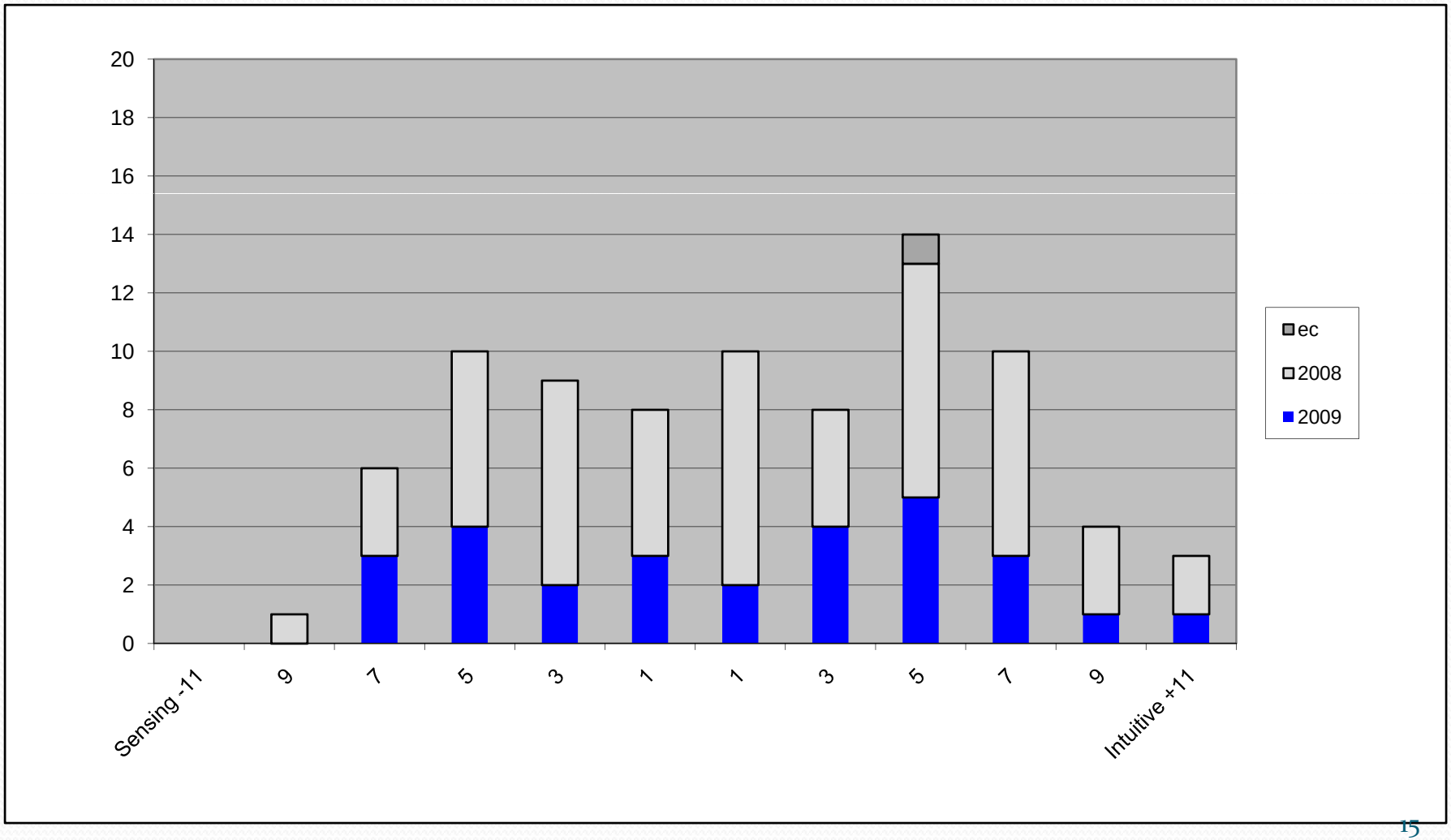
Sensing	Intuitive
like learning facts	prefer discovering relationships
solve problems by well-established methods	like innovation and dislike repetition
practical and careful	work quickly and innovatively
like connections to real world	don't like "plug-and-chug" courses w/ memorization
patient with details and good at memorizing facts	good at grasping new concepts and abstractions

Sensing vs. Intuitive (Strategies)

Sensing	Intuitive
ask instructor for specific examples of concepts and procedures	ask your instructor for interpretations or theories that link the facts
try to find specifics in textbook or other references or by brainstorming with friends or classmates	take time to read entire question before you start answering and be sure to check your results

Sensing vs. Intuitive

Average = 1.3



Visual vs Verbal (Description)

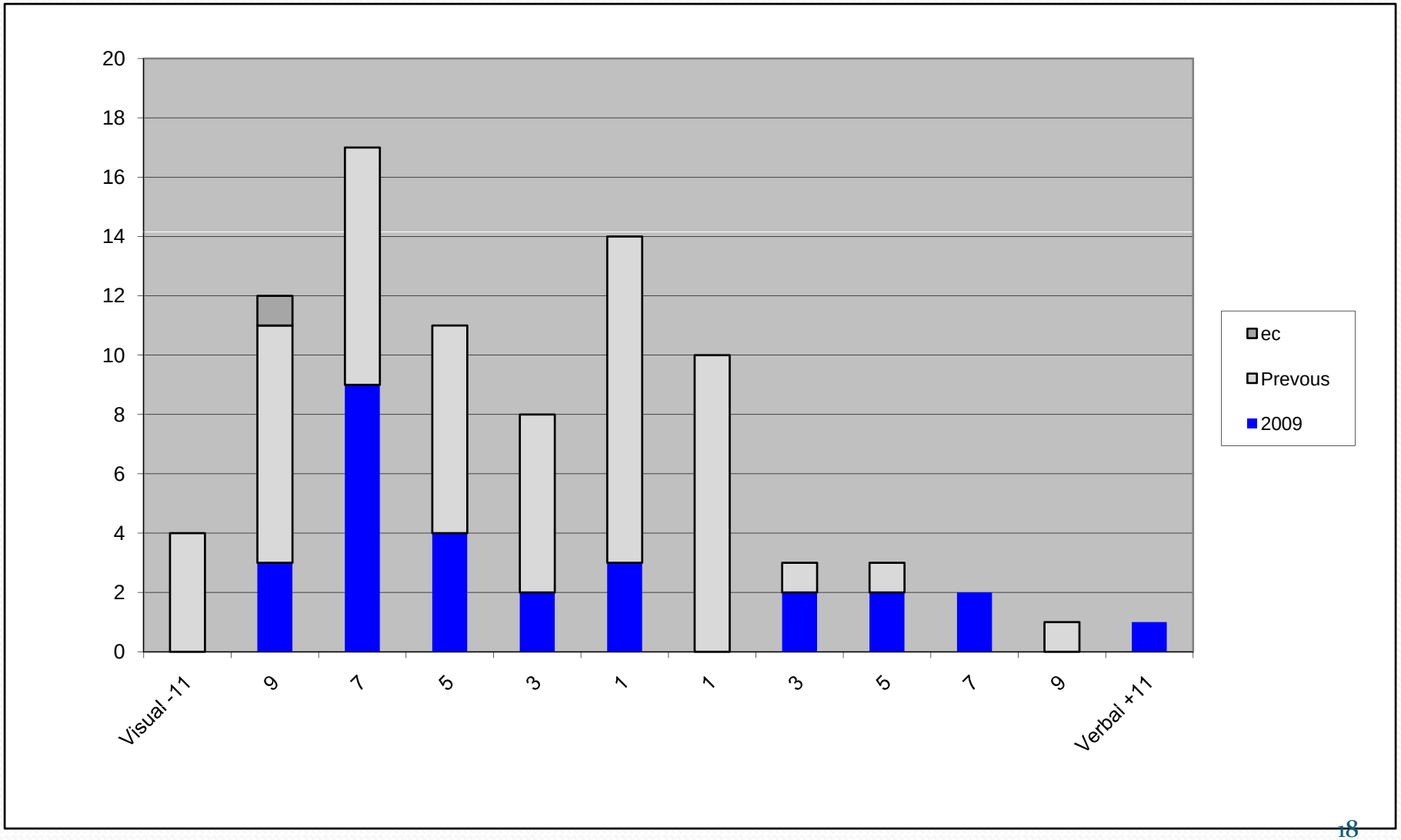
Visual	Verbal
remember best what they see--pictures, diagrams, flow charts, time lines, films, and demonstrations.	get more out of words--written and spoken explanations.

Visual vs Verbal (Strategies)

Visual	Verbal
try to find diagrams, sketches, schematics, photographs,...	write summaries or outlines of course material in your own words
see if any of the course material is available.	working in groups can be particularly effective: hearing classmates' explanations and even more when you explain
make concept map by listing key points, enclosing them in boxes or circles, and connecting	
Color-code your notes with highlighter	

Visual vs. Verbal

Average = -3.5



Sequential vs Global (Description)

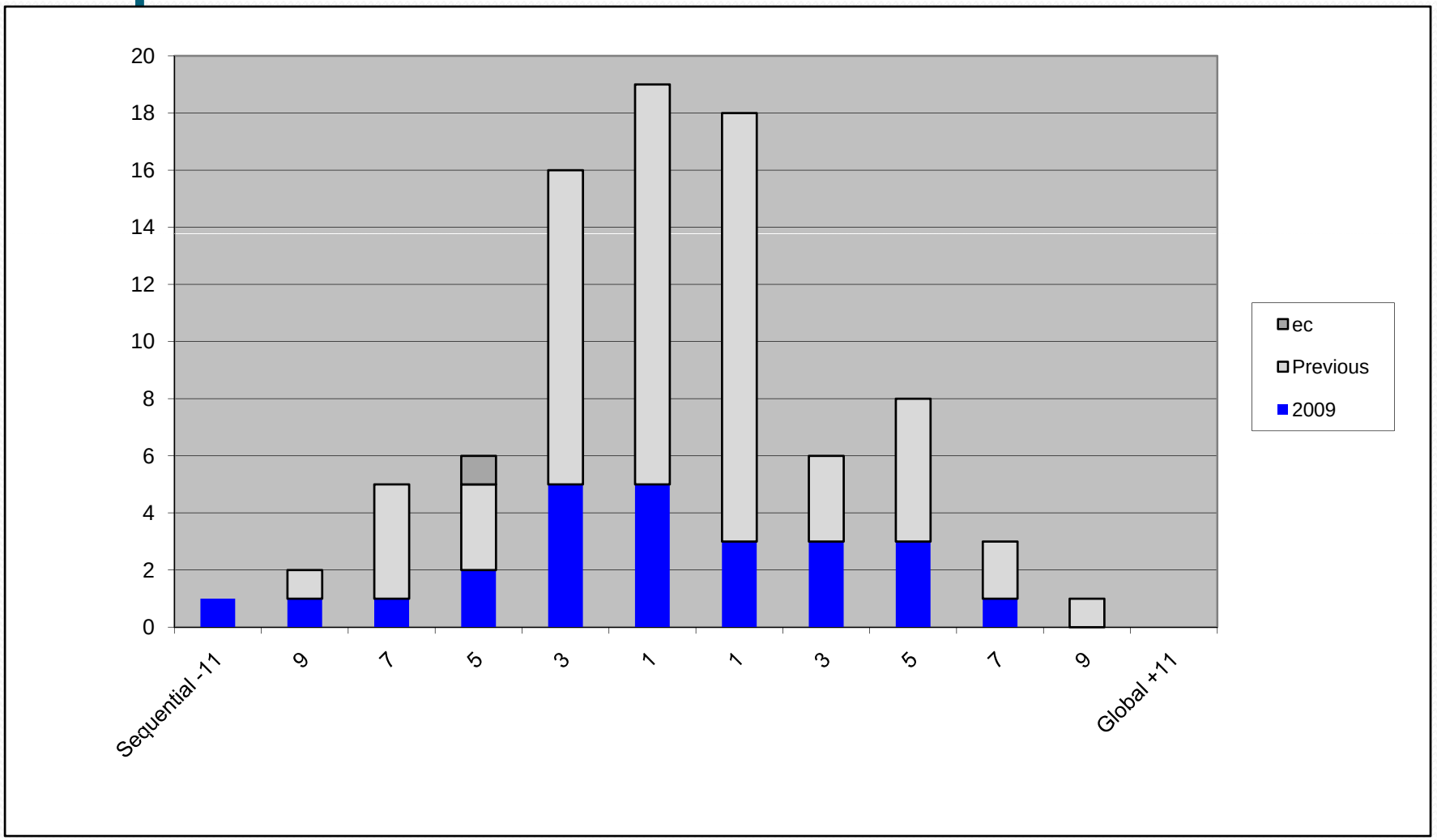
Sequential	Global
gain understanding in linear steps; each step following logically from the previous one	learn in large jumps, absorbing material almost randomly without connections, and then suddenly "getting it"
follow logical stepwise paths in finding solutions	may solve complex problems quickly or in novel ways once they have big picture, but may have difficulty explaining how they did it

Sequential vs Global (Strategies)

Sequential	Global
ask the instructor to fill in the skipped steps do so yourself	skim entire chapter to get overview
outline lecture material for yourself in logical order	immerse yourself in individual subjects for large blocks instead of short bursts
	relate the subject to things you already know

Sequential vs. Global

Average = -0.6



The 5th axis: Inductive-Deductive

- '…the "best" method of teaching … is induction, whether it be called problem-based learning, discovery learning, inquiry learning, or some variation on those themes.'
- 'On the other hand, the traditional college teaching method is deduction, starting with "fundamentals" and proceeding to applications.
- 'I don't want instructors to be able to determine somehow that their students prefer deductive presentation and use that result to justify continuing to use the traditional but less effective lecture paradigm in their courses and curricula. I have therefore omitted this dimension from the model.'

Teamwork

Teamwork (discussion)

What useful techniques or considerations have you employed to assign tasks to team members so that individuals can contribute equally or fairly? **Count off 1, 7**	Are there other problems you have seen? If so, what were they and how were they overcome? **Count off 2, 8**	Windows
If you notice that one person tends to withdraw because they feel uncomfortable contributing, what can be done to help that person feel more comfortable? **Count off 3, 9**	If you withdraw because you feel uncomfortable contributing, what can you do to feel more comfortable? **Count off 4, 10**	
If one person tends to dominate the group, what can be done to successfully reduce this domination? **Count off 5, 11**	If the team seems to be spinning its wheels and being unproductive, what can be done to get the group moving again? **Count off 6, 12**	
Front		

Teamwork (Synopsis I)

- What useful techniques or considerations have you employed to assign tasks to team members so that individuals can contribute equally or fairly?

  - Get together early in the project. Talk about our problem solving strategies before assigning tasks (perhaps in smaller groups).
  - Individuals tend to volunteer for what they do best; this helps everybody contribute equally.
  - Once the project is complete, everyone should ask questions in order to understand things entirely.
  - Get cell phone #'s to ease contact outside of lab time. Sometimes it is just better to say it directly because over email, it is easy to ignore someone. But, face to face (or phone call), you feel more obligated.
  - Make a time line to help with accountability.

Teamwork (Synopsis II)

- If one person tends to dominate the group, what can be done to successfully reduce this domination?

  - Be frank and tell them. Ask that person to take a step back.
  - Best to do it indirectly. Direct confrontation should be avoided as it can damage the group morale and make certain people feel unwanted.
  - It would be best for that person to step back a bit and guide the people that don't know about the project.
  - People can, as a group, tell the person dominating that they have other ideas and would rather go in a different direction. Be assertive.
  - Ask for a turn on the computer.
  - Delegate tasks so everybody has something to do.
  - Ask dominant person to explain so that the whole group is contributing.

Teamwork (Synopsis III)

- If you notice that one person tends to withdraw because they feel uncomfortable contributing, what can be done to help that person feel more comfortable?
  - Ask that person to interject their ideas, ask them how they feel the project/lab is going.
  - Ask if they think one of the rest of the group members' ideas is a good one
  - Encourage them and affirm his or her abilities.
  - If we are separating into computer work, we can give them control of the computer
  - Ask for an opinion that has no right or wrong answer
  - Give them a relatively easy task to boost their confidence
  - a hug

Teamwork (Synopsis IV)

- If you withdraw because you feel uncomfortable contributing, what can you do to feel more comfortable?

  • I try to take a risk and suggest an idea. Once I have contributed some, more contributing is easier.

  • Remind yourself that you are all in the same position. We are all freshmen and we can say our ideas even if they aren't very good because no one is going to judge you for it.

  • Try to get someone to explain to me what we're doing and give me a task to do that I feel comfortable doing

  • Use the computer.

  • Ask if there is any aspect that you can help with that does not include _____ aspect that you do not know about.

  • Talk to a higher authority (e.g., Professor)

Teamwork (Synopsis V)

- If the team seems to be spinning its wheels and being unproductive, what can be done to get the group moving again
  - Leave that task for a while and coming back later helps.
  - Ask questions to the professor or Wizards.
  - Someone should take charge and start with an idea even if it fails
  - Make sure you stress that we are all busy and we need to get this done as soon as.
  - Reassigning tasks.

Teamwork (Synopsis VI)

- Are there other problems you have seen? If so, what were they and how were they overcome?

  - Meeting with 3-4 other people outside of class is a challenge because we're all so busy with classes, athletics, and clubs. The wiki could be used to assign tasks and track progress.

  - Sometimes it is better to work with only a smaller group. Recognize when the whole group must meet and when work can be done with smaller contingents of the whole group.

  - When most people don't understand the work (say, in Matlab). Whoever “gets it” can explain.

  - Sometimes, team members may disagree on how well a problem needs to be answered.

  - Enthusiasm wanes in the aftermath of a project – the write-up suffers.

Ethics

Ethics (1)

Why have a code of ethics?

- to define accepted/acceptable behaviors;
- to promote high standards of practice (keep profession respected);
- to provide a benchmark for members to use for self evaluation;
- to establish a framework for professional behavior and responsibilities;
- to protect public;
- to protect engineers;
- to protect employers;
- as a vehicle for occupational identity.
- to identify and correct past errors
- to identify acceptable and unacceptable solutions to problems

Adapted from http://www.najah.edu/nnu_portal/file/centers/WESI/Teaching/MohammadAlmasri/Introduction%20to%20Engineering/%5B4-2%5D%20Ethics%20and%20Professional%20Responsibility.pdf

Ethics (2)

What should be included in a code of ethics?

- Acceptable safety margins / Standards to be followed
- Responsibility for final product / failures
- Protecting the public
- Intellectual honesty – not taking credit for others' work
- Give best effort to the employer
- To determine if the means to an end are acceptable
- Give guidelines for solution of a problem

Ethics (discussion)

ASME **Case Study 3** **Count off 1, 5, 9**	**IEEE** **Case Study 1** **Count off 2, 6, 10**	**Windows**
ACM **Case Study 4** **Count off 3, 7, 11**	**ASCE** **Case Study 2** **Count off 4, 8, 12**	
Front		

IEEE Code of Ethics

(Institute of Electrical and Electronic Engineers)

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree:

to accept responsibility in making decisions consistent with the safety, health and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;

1. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
2. to be honest and realistic in stating claims or estimates based on available data;
3. to reject bribery in all its forms;
4. to improve the understanding of technology, its appropriate application, and potential consequences;
5. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
6. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;
7. to treat fairly all persons regardless of such factors as race, religion, gender, disability, age, or national origin;
8. to avoid injuring others, their property, reputation, or employment by false or malicious action;
9. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics.

Case Study 1

You have been asked to observe how junior management use new accounting software at a leading city accountancy firm. As part of informed consent, staff are informed that they will remain anonymous. As part of your observations, you notice that many of the junior management staff are making a particular data entry error when using this software. These errors are causing the accountancy firm to lose profit. Company policy states clearly that workers salaries will be docked for clear mistakes leading to loss of company profit.

Questions:

– Would you alter the results of your study to protect the people who helped you in the study?

– How can you report results without causing harm to the participants?

– Would you cancel the study as soon as this conflict of interest is detected?

http://www.cdf.toronto.edu/~csc340h/summer/lectures/w4/L4-part2-ethics.pdf

ASCE Code of Ethics

(American Society of Civil Engineers)

Fundamental Principles

1. Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:
2. using their knowledge and skill for the enhancement of human welfare and the environment;
3. being honest and impartial and serving with fidelity the public, their employers and clients;
4. striving to increase the competence and prestige of the engineering profession; and
5. supporting the professional and technical societies of their disciplines.

Fundamental Canons

1. Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development3 in the performance of their professional duties.
2. Engineers shall perform services only in areas of their competence.
3. Engineers shall issue public statements only in an objective and truthful manner.
4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.
5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
6. Engineers shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the engineering profession and shall act with zero-tolerance for bribery, fraud, and corruption.
7. Engineers shall continue their professional development throughout their careers, and shall provide opportunities for the professional development of those engineers under their supervision.

Case Study 2

SITUATION: Newspaper articles reporting on an indictment of an engineering firm and its officers are forwarded to the Committee on Professional Conduct (CPC) by members of the local ASCE section. The indictment alleges that the firm has been overcharging its client, a local public agency, for the design work it was performing. Although none of the firm's principal officers are members of asce, an ASCE member working for the firm as an engineer also is indicted for lying to the grand jury during its investigation. This indictment is dropped in exchange for the member's testimony against the firm's officers, and the member is named as an unindicted coconspirator in the suit against the firm's president.

In his testimony at trial, the ASCE member admits to inflating the hours reported on his time sheets at the direction of his supervisor, who himself claimed to be acting on the orders of the firm's president. The firm and its president are convicted of falsifying records in order to overcharge the client, and a state court imposes fines and a suspended jail sentence on the guilty parties. After the trial and sentencing, the CPC advises the ASCE member of the ethics complaint filed against him and invites the engineer to discuss his involvement in the case before members of the CPC.

QUESTION: Did the engineer's actions in inflating the amounts reported on his time sheets as time spent on a public project violate asce's Code of Ethics?

http://pubs.asce.org/magazines/ascenews/2008/Issue_05-08/article4.htm

ASME Code of Ethics

(American Society of Mechanical Engineers)

The Fundamental Principles

Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

I. using their knowledge and skill for the enhancement of human welfare;
II. being honest and impartial, and serving with fidelity their clients (including their employers) and the public; and
III. striving to increase the competence and prestige of the engineering profession.

The Fundamental Canons

1. Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.
2. Engineers shall perform services only in the areas of their competence; they shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
3. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional and ethical development of those engineers under their supervision.
4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest or the appearance of conflicts of interest.
5. Engineers shall respect the proprietary information and intellectual property rights of others, including charitable organizations and professional societies in the engineering field.
6. Engineers shall associate only with reputable persons or organizations.
7. Engineers shall issue public statements only in an objective and truthful manner and shall avoid any conduct which brings discredit upon the profession.
8. Engineers shall consider environmental impact and sustainable development in the performance of their professional duties.
9. Engineers shall not seek ethical sanction against another engineer unless there is good reason to do so under the relevant codes, policies and procedures governing that engineer's ethical conduct.
10. Engineers who are members of the Society shall endeavor to abide by the Constitution, By-Laws and Policies of the Society, and they shall disclose knowledge of any matter involving another member's alleged violation of this Code of Ethics or the Society's Conflicts of Interest Policy in a prompt, complete and truthful manner to the chair of the Committee on Ethical Standards and Review.

Case Study 3

A recent graduate of Engineering Tech, you have been employed in the R & D Engineering Division of Larom, Inc. for the past several months. You were hired because of promising research you did with catalysts as a student.

A meeting of your division is called by your supervisor, Alex Smith. He announces that your unit must make a recommendation within the next two days on what catalyst should be used by Larom in processing a major product. The overwhelming consensus of the engineers in your unit, based on many years of experience, is that catalyst A is best for the job. But the research you have been conducting at Larom provides preliminary evidence that catalyst B might be more reliable, more efficient, and considerably less costly. So, you ask if the recommendation can be delayed another month to see if firmer evidence can be found.

Alex replies, "We don't have a month. We have two days." He asks you to write up the report, leaving out the preliminary data you have gathered about catalyst B. He says, "It might be nice to do some more research on B, but we've already taken too much time on this project. This is one of those times we have to be decisive--and we have to look decisive and quit beating around the bush. Management is really getting impatient with us on this one. Besides, we've had a lot of experience in this area.“

You like working for Larom, and you feel fortunate to have landed such a good job right out of Engineering Tech. You have no desire to challenge your colleagues. Besides you don't necessarily disagree with them about which catalyst is best. Still, you wish you had been given more time to work on catalyst B, and you feel uncomfortable about leaving the preliminary data out of the report.

What should you do? 1. Write up and sign the report as instructed. 2. Write up the report as instructed, but refuse to sign it. 3. Refuse to write up the report, threatening to go around Alex to the next level of management if a fully accurate report is not made. 4. Other.

http://web.missouri.edu/~umcengrmaeweb/students/Engineering_Ethics.pdf

ACM Code of Ethics

(Association for Computing Machinery)

1. GENERAL MORAL IMPERATIVES.

As an ACM member I will ....

1.1 Contribute to society and human well-being.

1.2 Avoid harm to others.

1.3 Be honest and trustworthy.

1.4 Be fair and take action not to discriminate.

1.5 Honor property rights including copyrights and patent.

1.6 Give proper credit for intellectual property.

1.7 Respect the privacy of others.

1.8 Honor confidentiality.

2. MORE SPECIFIC PROFESSIONAL RESPONSIBILITIES.

As an ACM computing professional I will ....

2.1 Strive to achieve the highest quality, effectiveness and dignity in both the process and products of professional work.

2.2 Acquire and maintain professional competence.

2.3 Know and respect existing laws pertaining to professional work.

2.4 Accept and provide appropriate professional review.

2.5 Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks.

2.6 Honor contracts, agreements, and assigned responsibilities.

2.7 Improve public understanding of computing and its consequences.

2.8 Access computing and communication resources only when authorized to do so.

Case Study 4

Three years ago Diane started her own consulting business. She has been so successful that she now has several people working for her and many clients. Their consulting work includes advising on how to network microcomputers, designing database management systems, and advising about security.

Presently she is designing a database management system for the personnel office of a medium-sized company. Diane has involved the client in the design process, informing the CEO, the director of computing, and the director of personnel about the progress of the system. It is now time to make decisions about the kind and degree of security to build into the system. Diane has described several options to the client. Because the system is going to cost more than they planned, the client has decided to opt for a less secure system. She believes the information they will be storing is extremely sensitive. It will include performance evaluations, medical records for filing insurance claims, salaries, and so forth.

With weak security, employees working on microcomputers may be able to figure out ways to get access to this data, not to mention the possibilities for on-line access from hackers. Diane feels strongly that the system should be much more secure. She has tried to explain the risks, but the CEO, director of computing and director of personnel all agree that less security will do. What should she do? Should she refuse to build the system as they request?

http://www.cdf.toronto.edu/~csc340h/summer/lectures/w4/L4-part2-ethics.pdf