Engineers and understanding competences

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What is Competence?

"Competencies consist of **knowledge, skills, experiences, qualities and practices** that are observable, verifiable, assessable and measurable. The attainment of these competencies provides the foundation for lifelong learning

- "Core competencies are **abilities** gained or enhanced and which are **important for student success** in academic pursuits, professional life and personal development."

What is Competence

- "An underlying characteristic of a person which enables him to deliver superior performance in a given job, role or situation"

- The "attribute bundle" including the intellectual, motivational, social & emotional capability aspects

3

What is Competence?

1
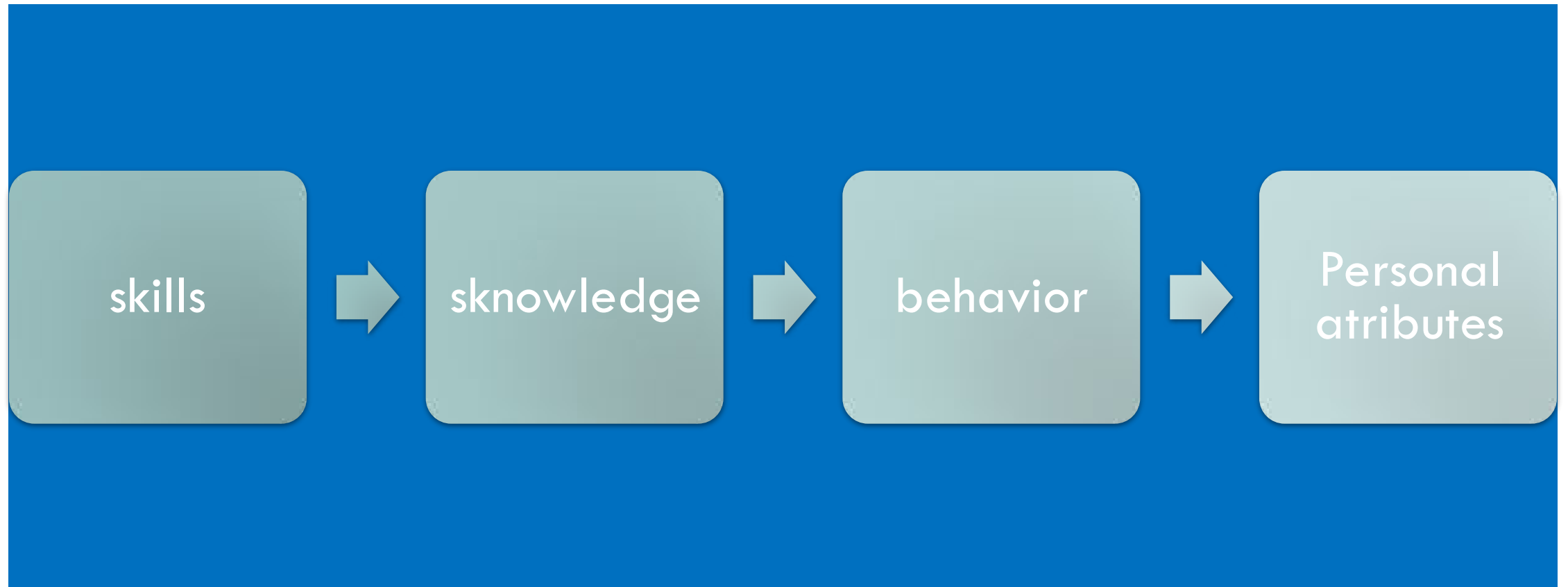- The set of knowledge, skills and behaviuor atttributes needded for a successful effective performance in an area.

2
- Demonstrated capabilities and behavioural manifestations

3
- Behaviours rather than a skill or knowledge

Components of Competence

skills → sknowledge → behavior → Personal atributes

Original Competences

- 1. Communication

  - Demonstrate ability to communicate effectively in verbal, nonverbal and written forms. Includes the ability to use appropriate technology that supports or facilitates communication.

Original Competences

- 2. Scientific, Mathematical and Technological Proficiency

Demonstrate ability to collect, organize, compute and interpret quantitative and qualitative data and/or information. Demonstrate the ability to apply mathematics, science and technology to make decisions.

Original Competences

- 3. Critical Thinking and Problem Solving
  - Demonstrate ability to think critically and to solve problems using basic research, analysis and interpretation
- 4. Information Literacy and Research
  - Demonstrate ability to identify, locate and use informational tools for research purposes.

Original Competences

- Social and Civic Responsibility
  - Demonstrate ethical and cultural awareness, an understanding of cultural diversity and effective and appropriate modes of social interaction.

Original Competences

- 6. Holistic Nature of Human Knowledge
  - Demonstrate knowledge of the relationships among the arts, sciences and technology.

Original Competences

- 7. Global Perspective
  - Demonstrate understanding of the value of a global perspective on society with respect to past, present and future events
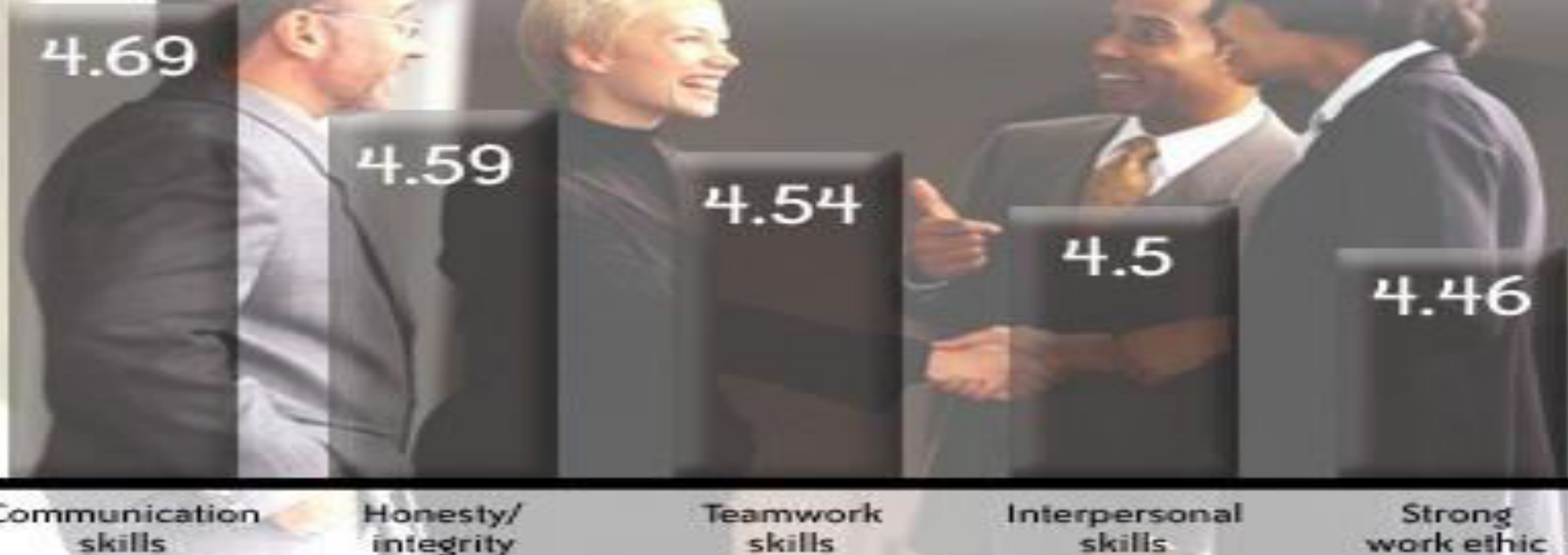
OVERALL CONCLUSIONS

Number of competencies – too many, few, or about right?

Old	New
1.Communication	1. Communication
2. Scientific, mathematical and technological proficiency	2. Scientific reasoning
	3. Quantitative reasoning
	4. Technological fluency
3. Critical thinking and problem solving	
4. Holistic nature of human knowledge	5. Innovative and critical thinking
5. Information literacy and research	6. Information literacy
6. Social and civic responsibility	7. Social and civic responsibility
7. Global perspective	8. Global perspective

Figure 1

TOP 5 NEW-HIRE SKILLS
(5-point scale: 1=not important, 5=very important)

Communication skills	Honesty/ integrity	Teamwork skills	Interpersonal skills	Strong work ethic
4.69	4.59	4.54	4.5	4.46

Source: Job Outlook 2002, National Association of Colleges and Employers

Job Outlook 2002 National Association of Colleges and Employers (NACE)

WHAT ZONE AM I IN?

Too Easy
- I get it right away…
- I already know how…
- This is a cinch…
- I'm sure to make an A..,
- I'm coasting…
- I feel relaxed,,,
- I'm bored…
- No big effort necessary.

THIS is the place to be.

On Target
- I know some things…
- I have to think…
- I have to work…
- I have to persist…
- I hit some walls…
- I'm on my toes…
- I have to regroup
- I feel challenged…
- Effort leads to success..

THIS is the achievement zone.

Too Hard
- I don't know where to start…
- I can't figure it out…
- I'm spinning my wheels…
- I'm missing key skills…
- I feel frustrated…
- I feel angry…
- This makes no sense…
- Effort doesn't pay off…

21ST CENTURY SKILLS

Critical Thinking & Problem Solving

Creativity & Innovation

Collaboration, Teamwork & Leadership

Cross-cultural Understanding

Communication & Media Literacy

Computing and ITC Technology

Career & Learning Self-direction

21ST CENTURY SKILLS

7 C's

1. **Critical Thinking and Problem Solving**

2. **Creativity and Innovation**

3. **Collaboration, Teamwork and Leadership**

Component Skills

1. **Research, Analysis, Synthesis, Project Management, etc.**

2. **New Knowledge Creation, Design Solutions, Storytelling**

3. **Cooperation, Compromise, Consensus, Community Building**

21ST CENTURY SKILLS

7 C's

Component Skills

4. **Cross Cultural Understandings**

4. **Diverse ethnic, knowledge and organizational cultures**

5. **Communication and Media Literacy**

5. **Crafting and analyzing messages, using technology effectively**

6. **Computing and ITC Literacy**

6. **Effective use of electronic information and knowledge tools**

21ST CENTURY SKILLS

7 C's

Component Skills

7. **Career and Learning Self Direction**

7. **Managing change, lifelong learning, and career redefinition**

CREATING A LEARNING ENVIRONMENT FOR 21ST CENTURY SKILLS

Students working in <u>teams</u> to experience and explore <u>relevant</u>, <u>real-world problems</u>, <u>questions</u>, <u>issues</u>, and <u>challenges</u>; then creating <u>presentations</u> and <u>products</u> to share what they have learned.

PROJECT LEARNING IS SKILL-BASED

- To learn collaboration –

  - **work in teams**

- To learn critical thinking –

  - **take on complex problems**

- To learn oral communication –

  - **present**

- To learn written communications –

  - **write**

PROJECT LEARNING IS SKILL-BASED

- To learn technology

  - **use technology**

- To develop citizenship

  - **take on civic and global issues**

- To learn about careers

  - **do internships**
- To learn content

  - **research and do all of the above**

IN A PROJECT LEARNING CLASSROOM

The teacher's role is one of coach, facilitator, guide, advisor, mentor…

not directing and managing all student work.

STUDENTS DEVELOP NEEDED SKILLS IN

➢ **Information Searching & Researching**

➢ **Critical Analysis**

➢ **Summarizing and Synthesizing**

➢ **Inquiry, Questioning and Exploratory Investigations**

➢ **Design and Problem-solving**

SIMULTANEOUS OUTCOMES

ACTIVITIES CONTENT PROCESSES HABITS OF MIND LIFELONG LEARNER
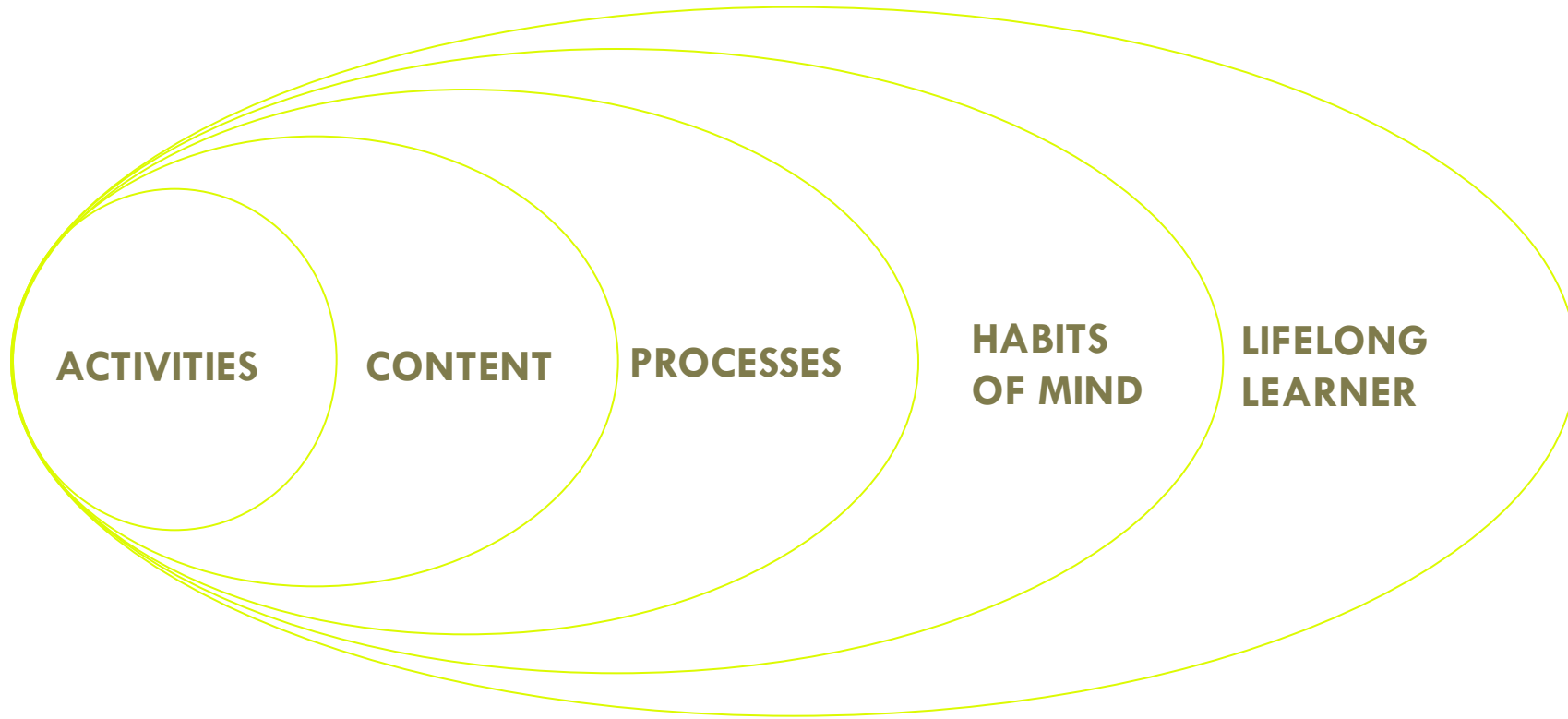
Adapted from the work of Art Costa and Bena Kallick

Building and Assessing Competencies
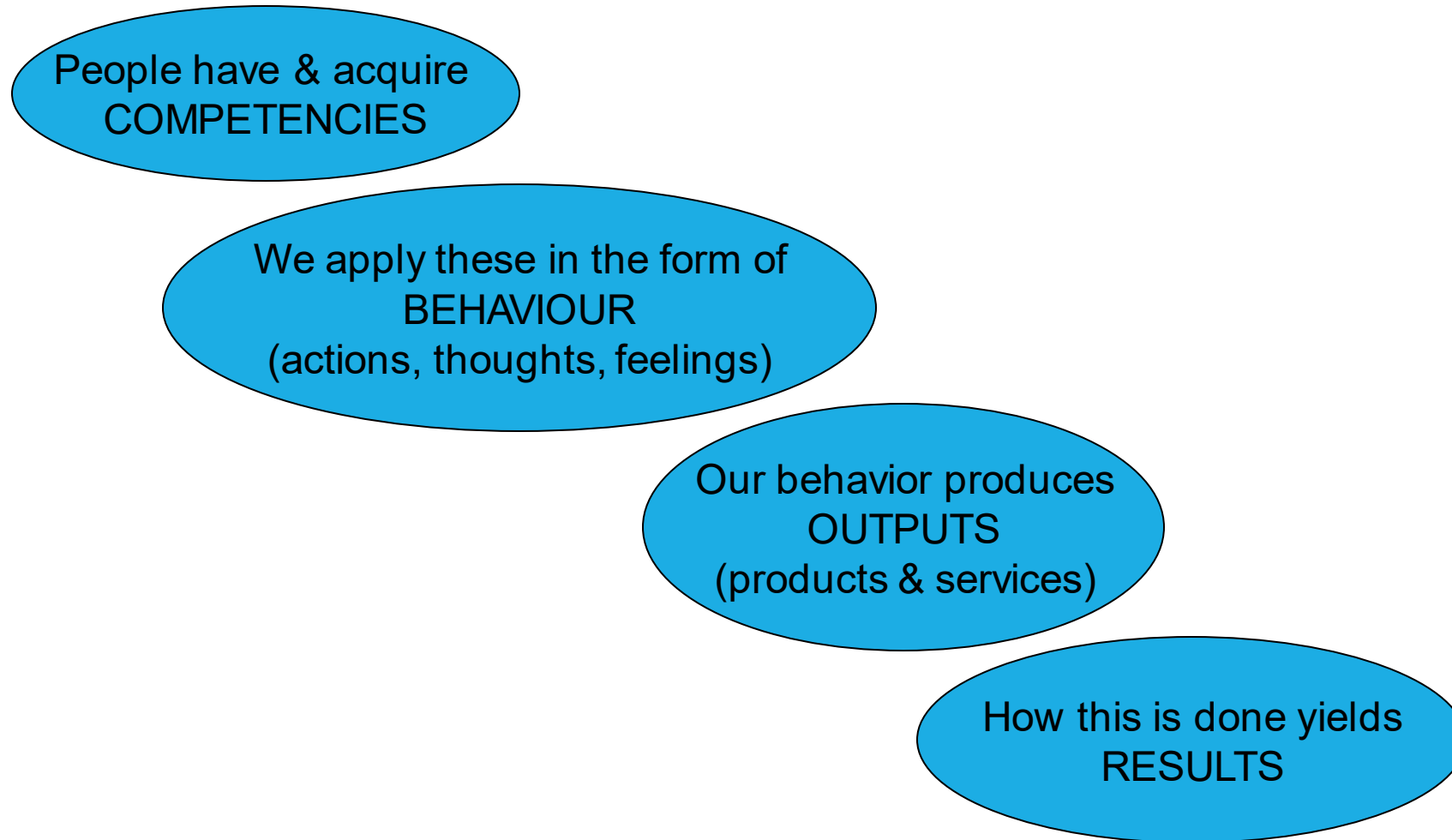
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What is Competency?

- "An underlying characteristic of a person which enables him to deliver superior performance in a given job, role or situation"

- The "attribute bundle" including the intellectual, motivational, social & emotional capability aspects

2

Characteristics of Competencies

- Observable & not inferred

- "Underlying characteristic" – deep & enduring part of personality

- Not restricted to a single job; the person is able to carry them along

Defining Competencies in Terms of Behaviors, Outputs and Results

People have & acquire
COMPETENCIES

We apply these in the form of
BEHAVIOUR
(actions, thoughts, feelings)

Our behavior produces
OUTPUTS
(products & services)

How this is done yields
RESULTS

4

Results vs Behavior

- At the heart of any successful activity lies a competency

- Managers usually focus on results (output) rather than behavior (process)

- Managing results may not be as effective as it seems

What Comprises The "Attribute Bundle"?

A. Intellectual Competencies:

1. Knowledge

- Processed information inside a person

- Predicts what an individual "can" do, rather than what he "wants" to do

- Eg. Computer / Linguistic / transcultural

A. Intellectual Competencies

2.   Skills

▪ "Ability to perform certain physical or mental tasks, accurately, consistently & meaningfully"

▪ e.g. decision making, rational / logical thinking, analysis & synthesis, organizing, leadership skills, communication, creativity & innovativeness

7

B. Emotional Competencies

❑<u>Traits:</u>

- Characteristic & consistent ways of behaving, thinking or feeling in response to stimulus / situations

- Eg. Initiative, tolerance of pressure, self-confidence, team player, learning style

8

C. Social Competencies

1. <u>Self – insight</u>

   Self perception & self image

   Eg. self – confidence or inferiority complex

2. <u>Values</u>

   Patterns of behavior held in high regard

   Differ across cultures / over time

   Eg. Interpersonal skills - modesty, aggression, deference

9

C. Social Competencies

3. <u>Beliefs</u>

   How accepting are you of a proposition or a statement

   Eg. How traditional are you ?

4. <u>Attitudes</u>

   Internal feelings which cause us to behave the way we do

   Contribute to positive & negative behavior

   Eg. Sense of responsibility, integrity, team spirit

D. Motivational Competencies

- Determined by things a person consistently thinks about or wants OR motives

- Motives "drive, direct or select" behavior towards certain actions or goals & away from others

11

TWO TYPES OF COMPETENCE MODELS

- Mc Clelland Model (1976)

- Lancaster Model (1967)

Mc Clelland Model (1976)

- People are motivated or driven by 3 basic needs :

A. Achievement

B. Affiliation

C. Power

- We possess all these in varying degrees – translates to differentiated behavior in an organizational setting.

✓ The US Department of State turned to eminent psychologist David McClelland (often credited to have coined the term competency) and his colleagues at a consulting firm MacBer and Company, to create an alternative selection system.

✓ McClelland and his team first identified characteristics that differentiated outstanding performers from average performers by using nominations and ratings from superiors, peers and clients.

✓ Next, they used behavioral event interviewing to get details of how outstanding performers dealt with critical situations, either effectively

Mc Clelland Model (1976)

A) <u>High Achievement Need Employees</u>

- Enjoy challenging tasks for which they are personally responsible for the outcomes
- Want to ensure that they succeed & meet deadlines

- Experience anxiety about projects until it completes successfully
- Require frequent reinforcement of hard data (sales figures, standards)

- Plan ahead to avoid serious problems in undertaking
- Tasks presenting great risks & improbability of success don't interest them

15

Mc Clelland Model (1976)

B)   High Affiliation Need Employees

- Direct their energies towards establishing & maintaining effective working relationships with others

- Concern for receiving approval from & being liked by peers, supervisors & subordinates becomes the critical factor in decision making & implementation

    Examine "human-side" of decisions

- They try to maintain harmony & mutual respect among members, while the group undertakes its function & objectives

C) HIGH POWER NEED EMPLOYEES

- Autocratic decision making

- Fluent; enjoy arguing & conforming conflict

- Tend to see situations as win/lose

17

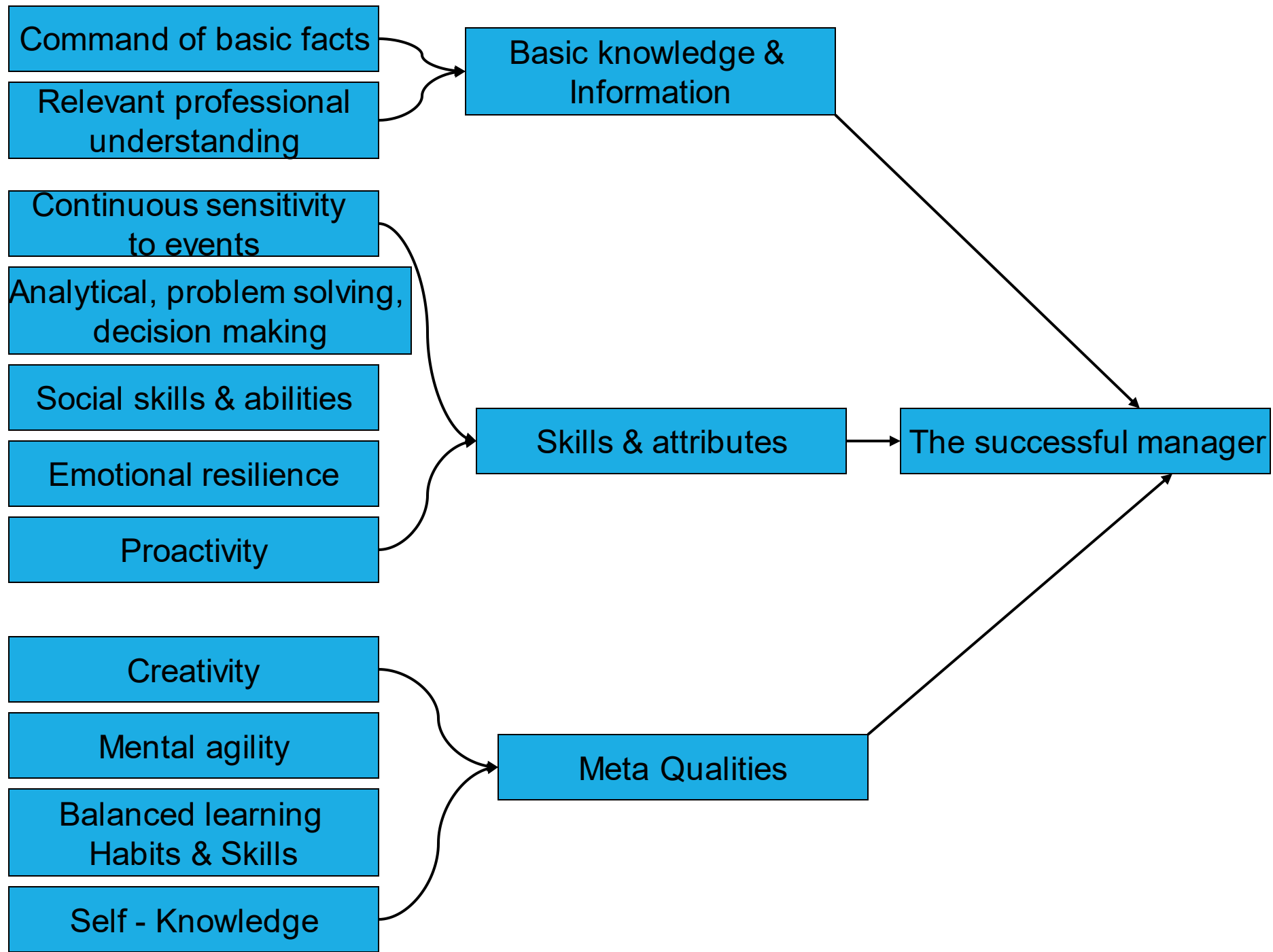# Define Competencies with examples of Positive and Negative Behavior

Team-working	Positive Behavior	Negative Behavior
"Builds effective working relationships with others, cooperates with colleagues to achieve goals & is sensitive to their needs	• Encourages others to contribute & give ideas •Builds on others' contributions •Gives priority to team goals •Celebrates team success	•Prefers to work alone •Promotes own ideas over others' •Criticizes others' contributions •Gives priority to meeting own needs •Does not consider impact on others

18

2. LANCASTER MODEL OF MANAGERIAL COMPETENCIES

Developed in 1976

Universal management competency framework

Comprises of 11 qualities divided into 3 groups or levels:

Command of basic facts

Relevant professional understanding

Basic knowledge & Information

Continuous sensitivity to events

Analytical, problem solving, decision making

Social skills & abilities

Emotional resilience

Proactivity

Skills & attributes

The successful manager

Creativity

Mental agility

Balanced learning Habits & Skills

Self - Knowledge

Meta Qualities

Lancaster Model of Managerial Competencies Explanation

1. Level 1: Basic Knowledge & Information

   Competence 1: Command of Basic Facts:

   - Knowledge of basic facts of business

   - Knowledge of company's short & long term goals & products

   - Knowledge of roles & relationships between different departments

   Competence 2: Relevant Professional Knowledge:

   - Specific Knowledge useful for the job – legal / financial control

Lancaster Model of Managerial Competencies Explanation

2. Level 2: Skills & Attributes:

Competence 1: Continuous sensitivity to events:

- Being aware of what is going on
- Perceptive & open to information: hard information (facts & figures) & soft information (feelings of other people) Can respond suitably

Competence 2: Analytical, problem solving, decision making:

- Judgment, intuition, weighing pros & cons

Lancaster Model of Managerial Competencies Explanation

Competence 3: Social skills & abilities :

- Interpersonal skills – communicating, delegating, negotiating, resolving conflict, persuading

Competence 4: Emotional Resilience:

- Ability to cope with emotional stress & strain without getting insensitive & losing self-control

Competence 5: Proactivity:

- Dedication & Commitment
- Taking responsibility by considering the long-term goals & impact of decision

Lancaster Model of Managerial Competencies Explanation

3. Level 3: Meta Qualities: situation specific skills

   Competence 1: Creativity:

- Ability to come up with unique ideas & solutions
- Insight to use useful ideas from another source

   Competence 2: Mental agility:

- Grasping problems quickly
- Thinking about several things at once

Lancaster Model of Managerial Competencies Explanation

Competence 3: Balanced learning habits & skills:

- Ability to use a range of learning processes – teaching, discovering from personal experiences & reflection

- Exhibit independence as learners

Competence 4: Self knowledge:

- Being aware of own beliefs, goals, values, feelings, behavior & the part they play in influencing actions

What is Personality ?

- Derived from the Latin word "Persona"

- "A person's typical or preferred way of behaving, thinking & feeling"

26

Components of Personality

1. Temperament

   Feelings & Emotions

   Moods

2. Motivation

   What drives an individual ?

   What directs his behavior ?

27

Components Of Personality

3. <u>Values</u>

   What behavior do we have respect for ?
   Differs across cultures & over time
   Modesty, Aggression, Deference

4. <u>Interests</u>
   Things we want to do & focus on
   What are our goals ?

5. <u>Attitudes</u>

28

PROCESSES FOR SELF-ASSESSMENT OF CORE COMPETENCIES

You can ...

Start with the student

▪ *What are you feeling good about? What have you learned to do?*

Start with one or more curriculum areas

▪ Focus on connections between core competencies and curricular competencies. Start with one or two core competencies that are central to the subject area – or search out one that isn't!

Start with one of the competencies – look for it everywhere – curricula, cross-curricular, extra-curricular ..

STARTING WITH THE STUDENT …

A student is not a collection of competencies – a student is a person who has competencies that vary from one context to another

THE COMPETENCIES ARE ALL ABOUT STRENGTHS.

THEY ARE NOT THE INCOMPETENCIES!

SELF-ASSESSMENT OPTIONS: GETTING STARTED

Use the words and phrases for ongoing self-assessment activities and discussions. For example:

1. Choose two words and phrases that are a lot like you. Give evidence.

2. Give three cards:
   - A bit like me
   - Quite Like me
   - Very much like me

EXAMPLES: "I CAN ..."

Celebrate my efforts and my work	Set goals that match my skills
Make healthy choices	Make and carry out a plan
Tell other people about what I am good at	Use strategies that help keep me calm
Be focused and determined	Show what I want and need
Stick with tasks that are hard for me	Stand up for myself and my ideas
Take responsibility for my learning	Keep my personal information private when I am online
Recognize the consequences my actions have on others	Recognize my emotions

EXAMPLE OF A "SORT"

A bit like me	Quite like me	Very much like me
Stand up for myself and my ideas	Make healthy choices	Celebrate my efforts and my work
Stick with tasks that are hard for me	Recognize my emotions	Tell other people about what I am good at
Take responsibility for my learning	Recognize the consequences my actions have on others	*Keep my personal information private when I am online*
	Use strategies that help keep me calm	

Sample Questions For Reflecting On Core Competencies

Note: Many questions touch on more than one competency.

Communication

1. How did you show you were listening thoughtfully? In what ways did your listening contribute to the group's understanding?

2. What are some ways you like to show your learning? What makes [name a form they identified] work for you?

3. What do you do when you disagree with someone in your group or discussion? How did you learn/develop that strategy?

Sample Questions For Reflecting On Core Competencies

Creative thinking

▪How do you come with ideas when you want to make something new – at school or at home? Tell me about a time when you felt really good about a new idea you had?

▪What helps you get new ideas?

▪What makes you want to think of new ideas or try something new?

SAMPLE QUESTIONS FOR REFLECTING ON CORE COMPETENCIES

Critical Thinking

- [After some experiences with a topic or question] How has your thinking about .... changed? What made it change?

- What strategies do you use to decide whether to believe something you read/on a social media site? How did you develop those strategies? What advice would you give a younger student about figuring out what is true?

- [In response to reading/hearing/offering an opinion] Who might have the same opinion about [this issue]? Who can you think of that might disagree? What reasons might they have for seeing things differently?

SAMPLE QUESTIONS (CONTINUED)

Social Responsibility

- How do you use words and actions to encourage other students who might be feeling a bit sad or discouraged? (What are some words and phrases you use?)

- What contribution to our school do you feel good about? How did you get started doing that?

- What are some ways you are a good friend? What strategies are you good at for making and keeping friends?

Sample Questions For Reflecting On Core Competencies

Personal Identity

- What are your strengths as a learner?

- How do you learn best?

- What's most important to you? (Can be anything at school, home, community ...)

- Tell me about one or two people or groups that influence your thinking and your actions. Why are they important to you? How do they influence you? How do you influence them?

Sample Questions For Reflecting On Core Competencies

Personal Awareness and Responsibility

- Tell me about one your learning goals. [prompt: Something you want to get better at or learn how to do.] How did you come to choose that goal? Tell me about something you are doing to help you work on that goal.

- What do you do to help yourself when you are feeling a bit discouraged about your work?

- Think of times when you have to wait. What strategies do you use when you are feeling impatient? How did you develop that strategy? (Prompt: When did you start? How does it work?)