Co-funded by the
Erasmus+ Programme
of the European Union

META-PROFILE

Tuning
Asia - South East

SAG: Civil Engineering

Members

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1	Virak Han#	Institute of Technology of Cambodia	Cambodia	virak@ite.edu.kh
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5	Neil Edwin ESCALONA	University of San Augustin	Philippines	
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10	NGUYEN Minh Tam#	Ho Chi Minh University of Technology	Vietnam	nmtam@hcmut.edu.vn
11	NGUYEN Tien Dung#	National University of Civil Engineering	Vietnam	dungnt1@nuce.edu.vn

* Coordinator
# New/replacement member

Experts/Observers

	Name	University	Country
1	Emilien AZEMA	Universite de Montpellier	France
2	Diego LO PRESTI	Universita di Pisa	Italy
3	Alfredo SOEIRO	Universidade do Porto	Portugal

SOME CONCLUSIONS FROM SURVEY

- We took survey results cautiously
    - Asia is more courteous in answering, therefore the high marks may be a reflection of this courteousness
    - Some possible discrepancies in the survey answers especially on “Achievement” - due to the question “Level to which developed by university degree (achievement)”
    - As a result we were more cautious about using the gap analysis between “importance” and “achievement”
- We however agreed that all competencies (generic and specific) are important
- We also agree that the numbers in the rank should not be given too much an emphasis as they are all important, however, when the low items are consistently across all respondent categories, they must be scrutinised especially if they will impact the ultimate outcome of a civil engineer
- We agree that ranking gives better indication than rating because respondents have to to think harder before they rank the best five in terms of importance

Critical review on survey result

- The low gap between achievement and importance is highly correlated with bottom 5 of the generic and specific competencies.
- This indicates that the least important competency can be considered more successful in terms of achievement among all stakeholders.
- The importance, achievement and gap marks are highly scattered for generic competency among all stakeholders.

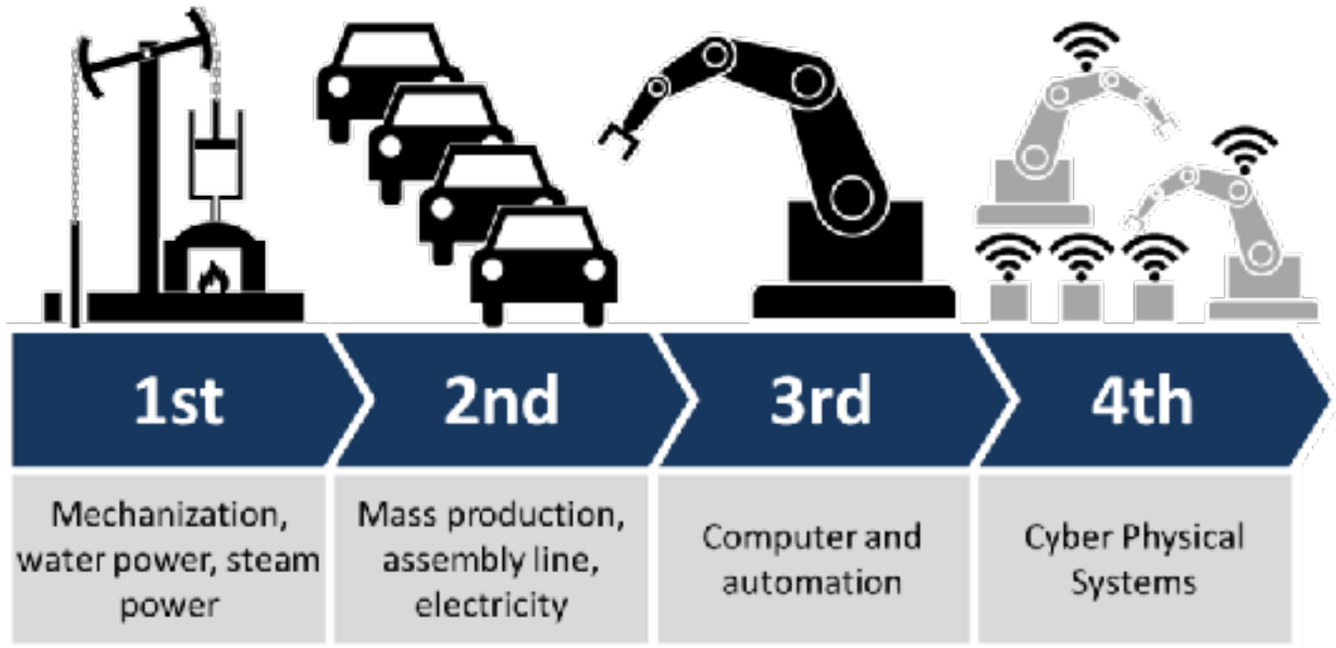
Critical review on survey result

- Graduates and student have low marks for gap across all generic and specific competencies.
- The importance and gap marks are highly scattered for specific competency. However, the achievement yields the most consistent pattern among all stakeholders.
- The ranking and rating are relatively uncorrelated for specific competency as opposed to generic competency.

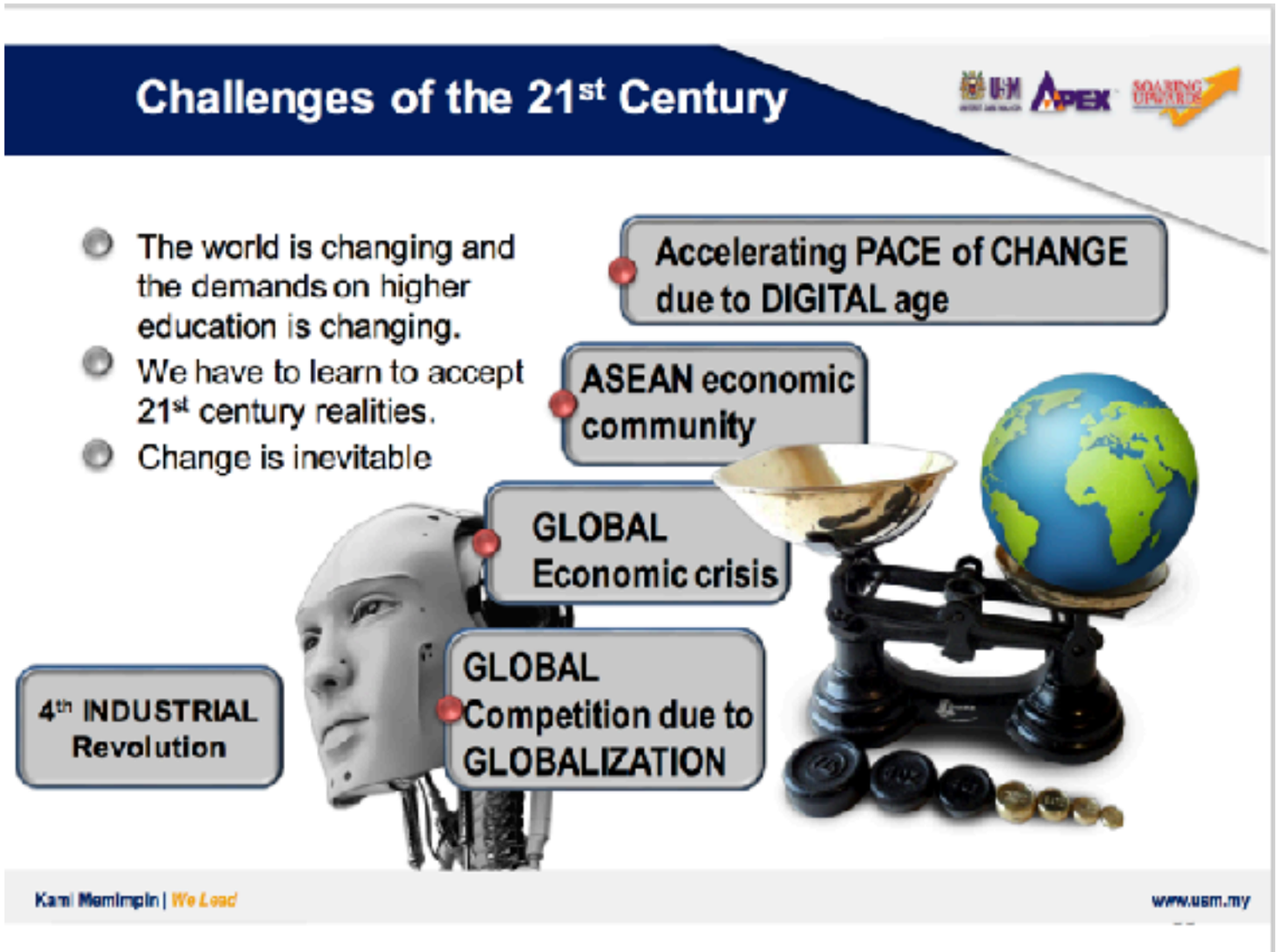
Some Leads when designing the Meta Profile

- Need to include the SDG Goals
- Need to look into the implications of the 4th Industrial Revolution
- May incorporate some form of gap analysis from the survey
- May apply some weightage based on importance and achievement of competencies
- Need to find the best way of clustering
- Need to cross-refer to present Programme Outcomes from professional bodies or other QA requirements


Enter into the
4th Industrial Revolution...
GET PREPARED NOW!


1st
2nd
3rd
4th
Mechanization, water power, steam power
Mass production, assembly line, electricity
Computer and automation
Cyber Physical Systems


EISA
Preparing students for the 4th Industrial Revolution
Implications for science education
Andreas Schleicher
Director for Education and Skills
OECD


Challenges of the 21st Century
The world is changing and the demands on higher education is changing.
We have to learn to accept 21st century realities.
Change is inevitable
Accelerating PACE of CHANGE due to DIGITAL age
ASEAN economic community
GLOBAL Economic crisis
GLOBAL Competition due to GLOBALIZATION
4th INDUSTRIAL Revolution
Kami Memimpin | We Lead
www.usm.my

Attributes of 21st Century Learners

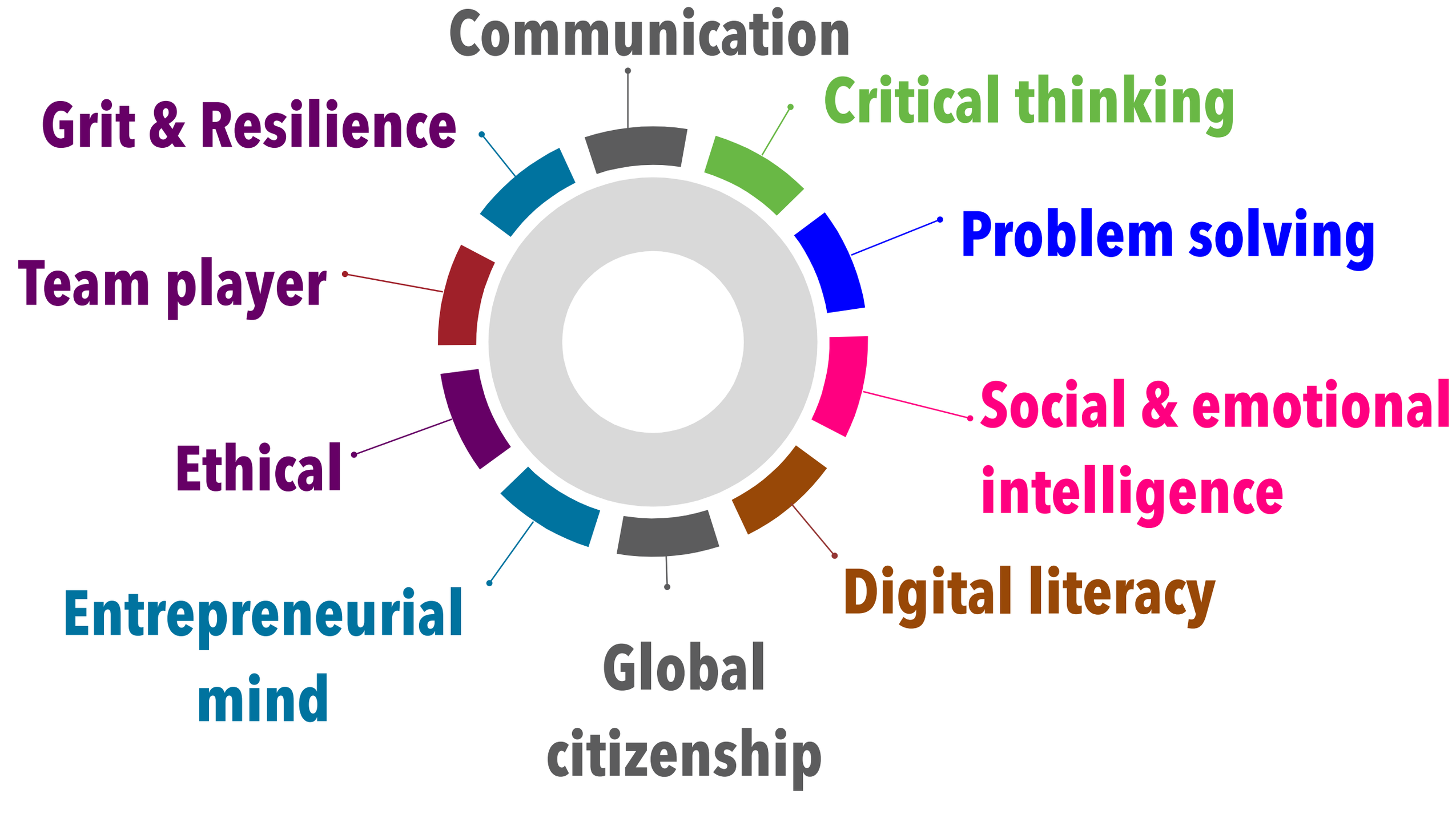
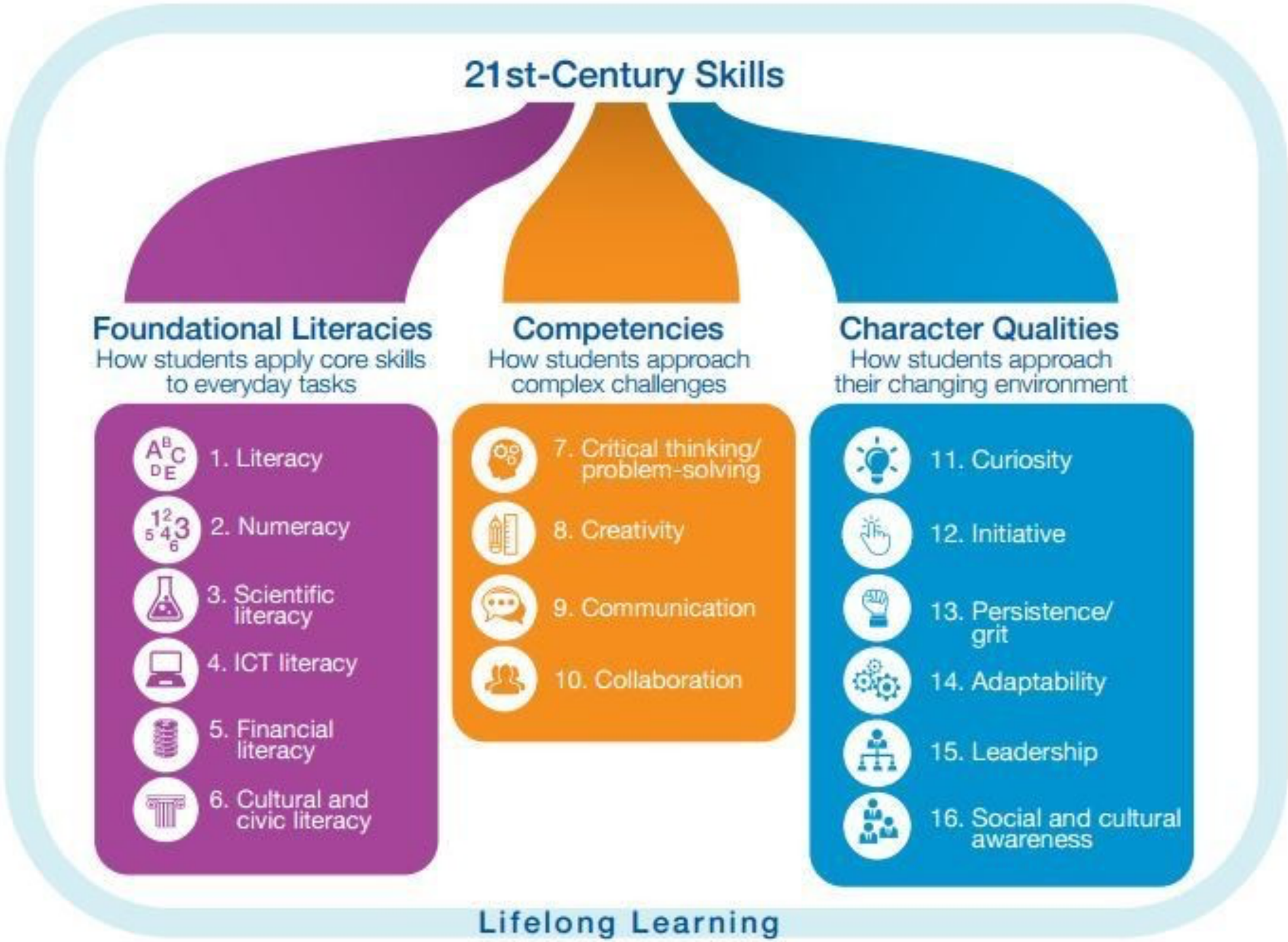


Exhibit 1: Students require 16 skills for the 21st century



Note: ICT stands for information and communications technology.

Source: World Economic Forum: What are the 21st-century skills every student needs?

META-PROFILE FRAMEWORK

Future Uncertainties

1. The 21st Century Challenges
2. The 4th Industrial Revolution
3. Other challenges

+

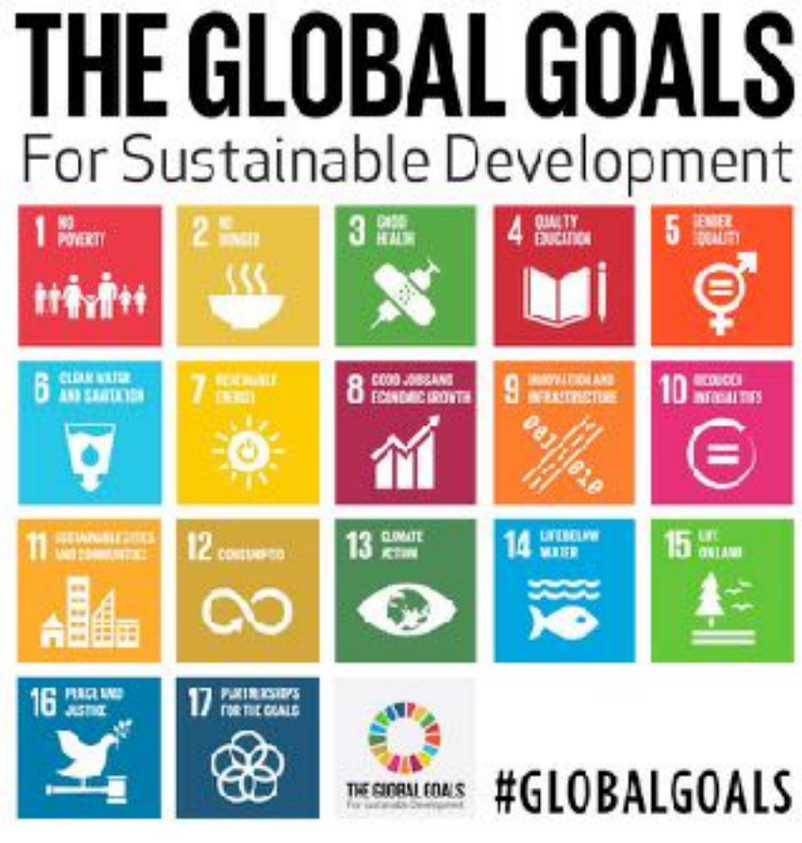
Values

INNER STRENGTH & QUALITIES

KNOWLEDGE
(Other Literacies)
(Engineering Literacies)

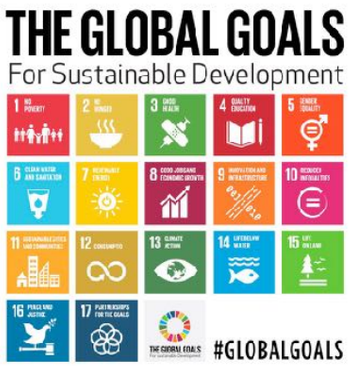
Thinking Skills (Personal Skills)

Inter-personal Skill (Social skills)



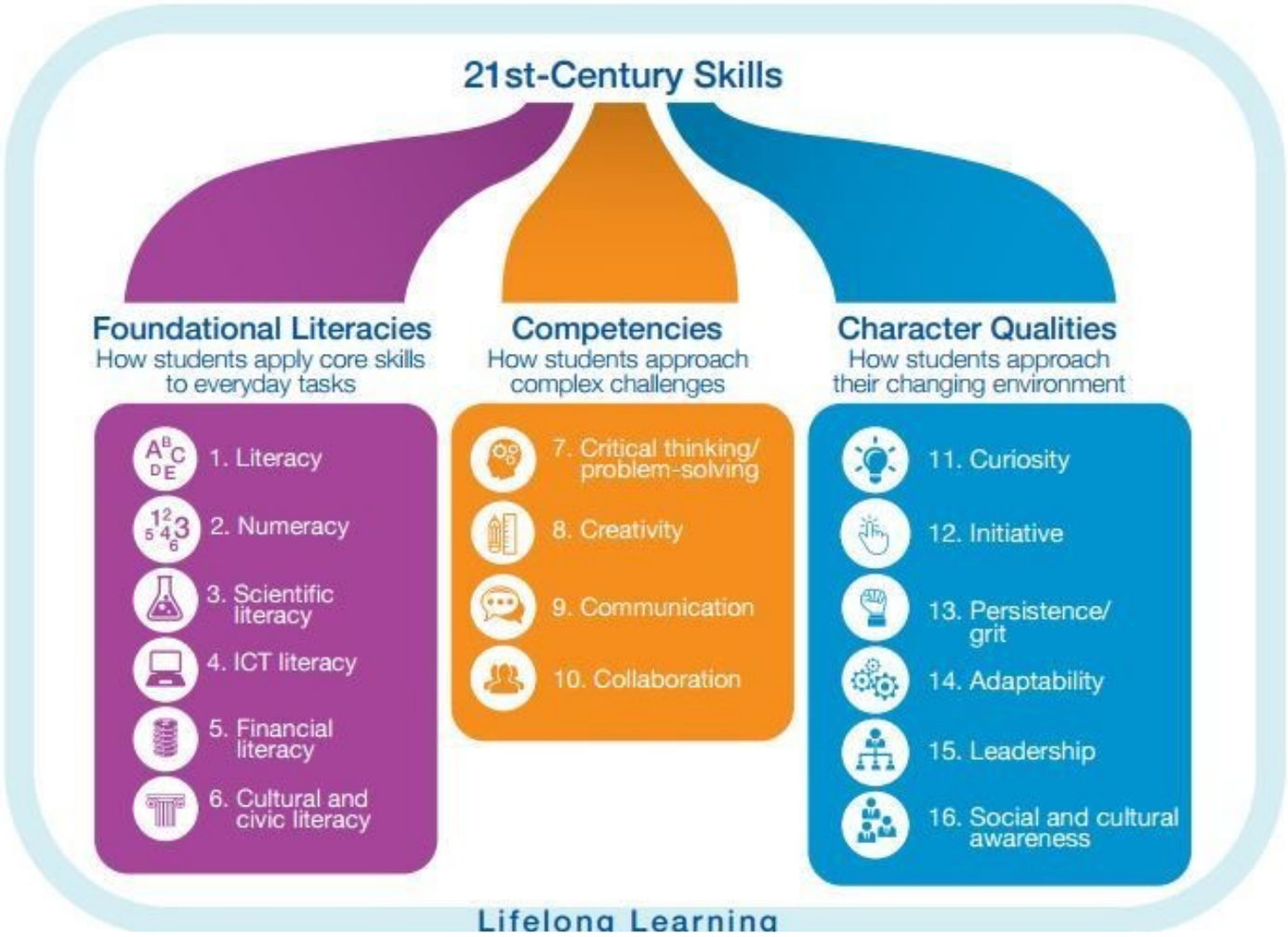
Sustainable Development Goals

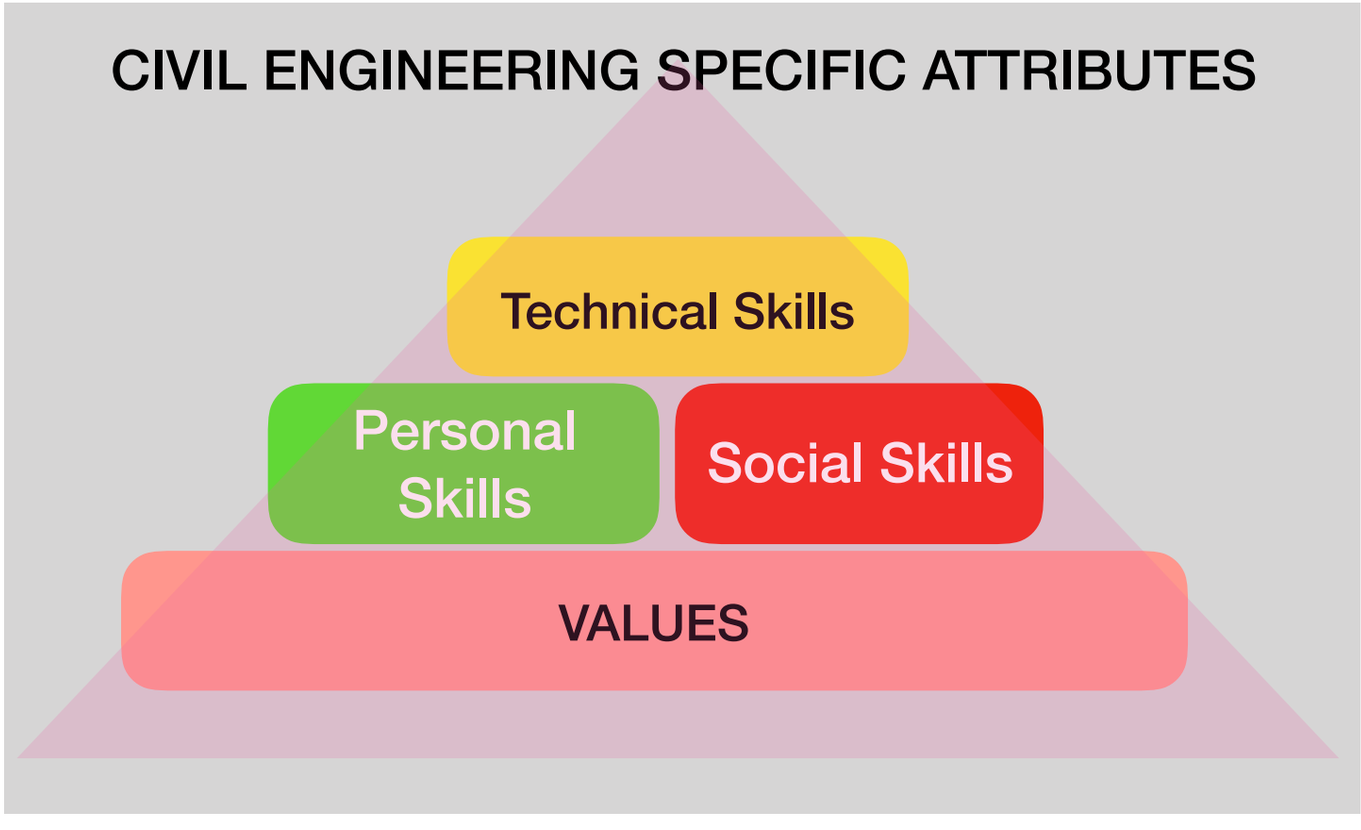
1	No Poverty
2	Zero Hunger
3	Good Health and Well Being
4	Quality Education
5	Gender Equality
6	Clean Water and Sanitation
7	Affordable and Clean Energy
8	Decent Work and Economic Growth
9	Industry Innovation and Infrastructure
10	Reduced Inequalities
11	Sustainable Cities and Communities
12	Responsible Consumption and Production
13	Climate Action
14	Life Below Water
15	Life on Land
16	Peace and Justice
17	Partnership for the goals

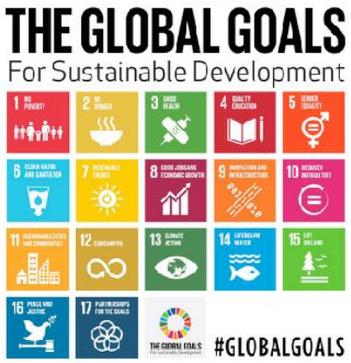


	Sustainable Development Goals	Civil Engineering Role
1	No Poverty	Indirect
2	Zero Hunger	Indirect
3	Good Health and Well Being	Direct
4	Quality Education	Indirect
5	Gender Equality	
6	Clean Water and Sanitation	Direct
7	Affordable and Clean Energy	Direct
8	Decent Work and Economic Growth	Indirect
9	Industry Innovation and Infrastructure	Direct
10	Reduced Inequalities	Direct
11	Sustainable Cities and Communities	Direct
12	Responsible Consumption and Production	
13	Climate Action	Indirect
14	Life Below Water	Indirect
15	Life on Land	Indirect
16	Peace and Justice	
17	Partnership for the goals	

Early clustering of Meta-profile for civil engineering



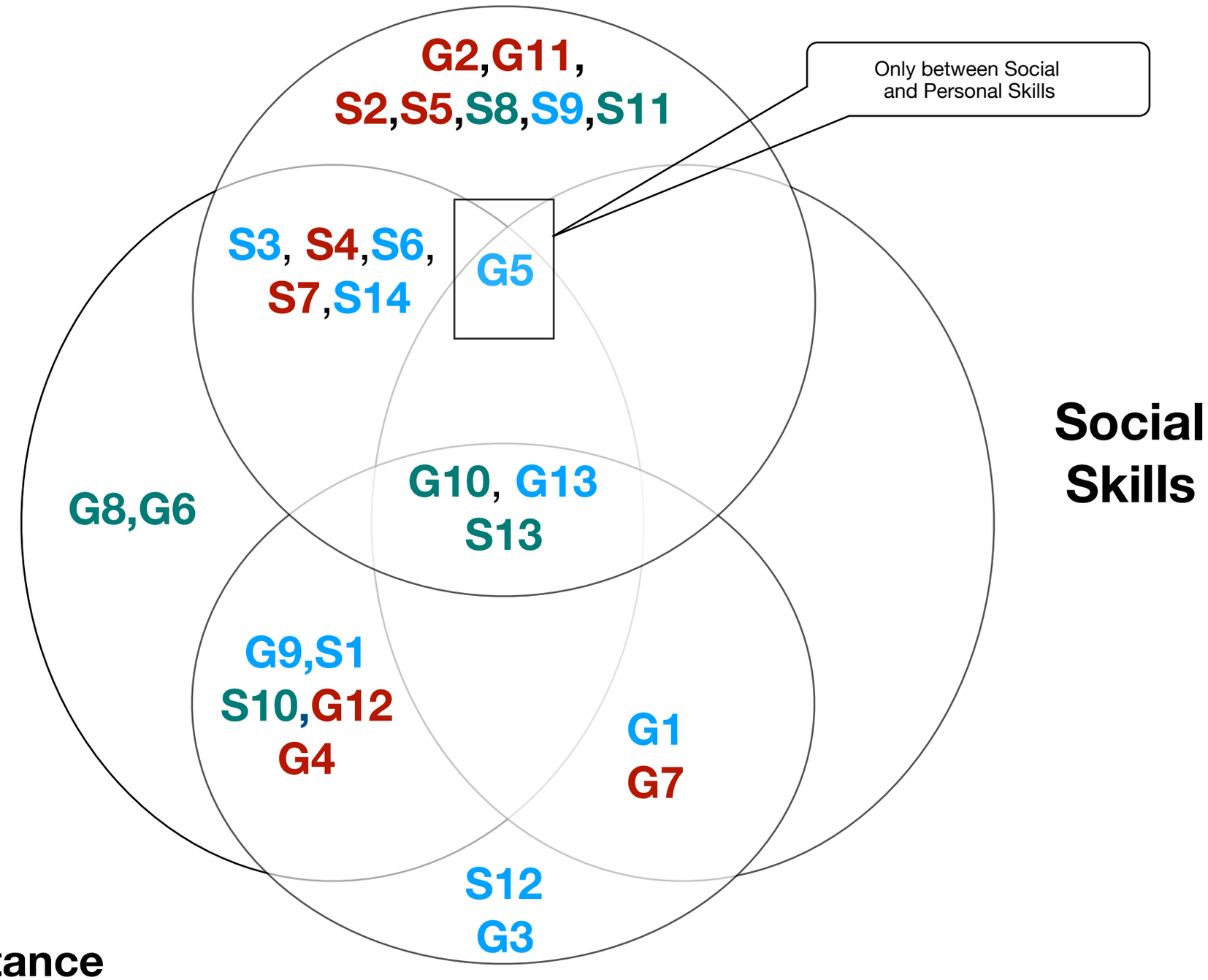




Categorization by skill-set + Values

		Primary	Secndry
G1	Ability to work collaboratively and effectively in diverse contexts	Social sk'l	Values
G2	Ability to use information and communication technology purposefully and responsibly	Tech sk'l	
G3	Ability to uphold professional, moral and ethical values	Values	
G4	Ability to demonstrate responsibility and accountability towards the society and environment	Values	Persnl sk'l
G5	Ability to communicate clearly and effectively	Social sk'l	Persnl sk'l
G6	Ability to think critically, reflectively and innovatively	Persnl sk'l	
G7	Ability to understand, value, and respect diversity and multiculturalism	Social sk'l	Values
G8	Ability to carry out lifelong learning and continuous professional development	Persnl sk'l	
G9	Demonstrate problem solving abilities	Persnl sk'l	Values
G10	Ability to initiate, plan, organise, implement and evaluate course of actions	Tech sk'l	Values
G11	Ability to conduct research	Tech sk'l	Persnl sk'l
G12	Ability to demonstrate leadership attributes	Persnl sk'l	Values
G13	Ability to apply knowledge into practice	Tech sk'l	Values
S1	Ability to demonstrate entrepreneurial attributes (creative, risk taking, resilient and innovative)	Persnl sk'l	Values
S2	Ability to show strong knowledge in science and mathematics (including statistics)	Tech sk'l	
S3	Ability to interpret engineering drawings	Tech sk'l	Persnl sk'l
S4	Ability to create algorithm to solve engineering problems	Tech sk'l	Persnl sk'l
S5	Ability to understand principles of material science	Tech sk'l	
S6	Ability to carry out civil engineering analysis	Tech sk'l	Persnl sk'l
S7	Ability to interpret engineering data from testing	Tech sk'l	Persnl sk'l
S8	Ability to utilise relevant design codes and regulations	Tech sk'l	
S9	Ability to design civil engineering elements (e.g : structural, geoTech, water, transport &highway, env engr, etc)	Tech sk'l	
S10	Ability to monitor the progress and quality of civil engineering works	Persnl sk'l	Values
S11	Ability to identify the appropriate construction technology and methods	Tech sk'l	
S12	Ability to uphold safety	Values	
S13	Ability to evaluate the impact of engineering decisions	Tech sk'l	Values
S14	Ability to integrate all civil engineering knowledge into a workable system	Tech sk'l	Persnl sk'l

Categorization by skill-set + Values

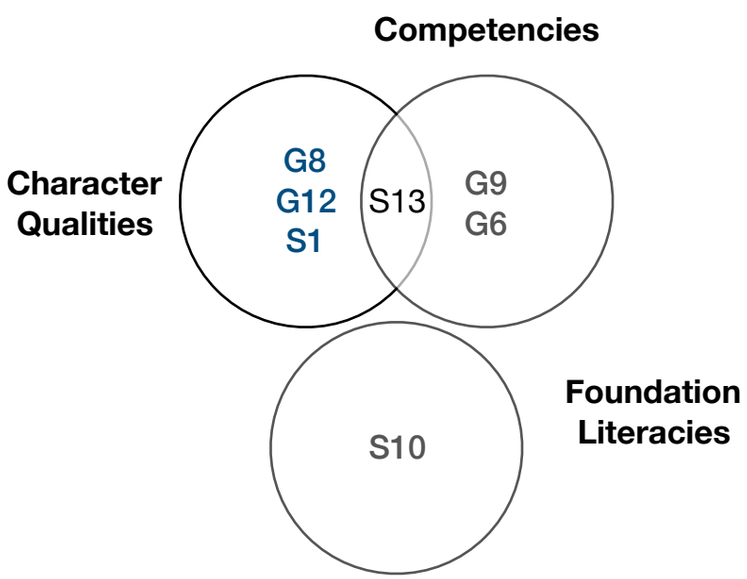


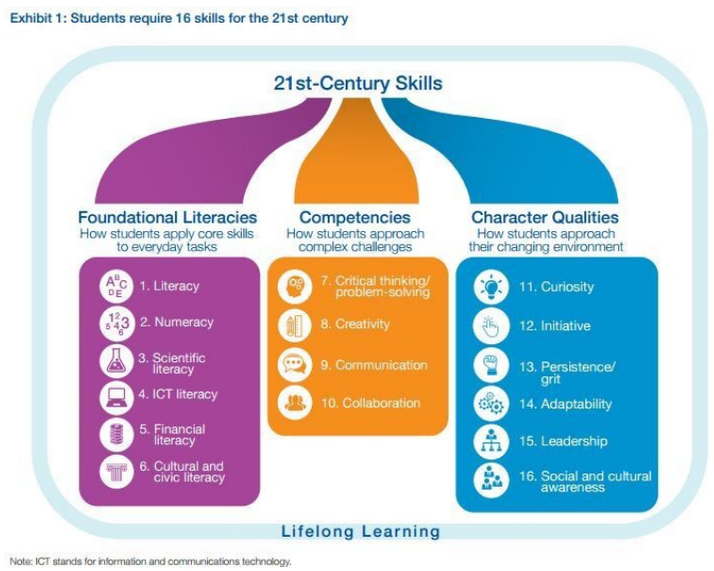
Survey Results

- Top in importance
- Medium in importance
- Bottom in importance

Categorization According to the Cluster Used in the 21st Century Skills

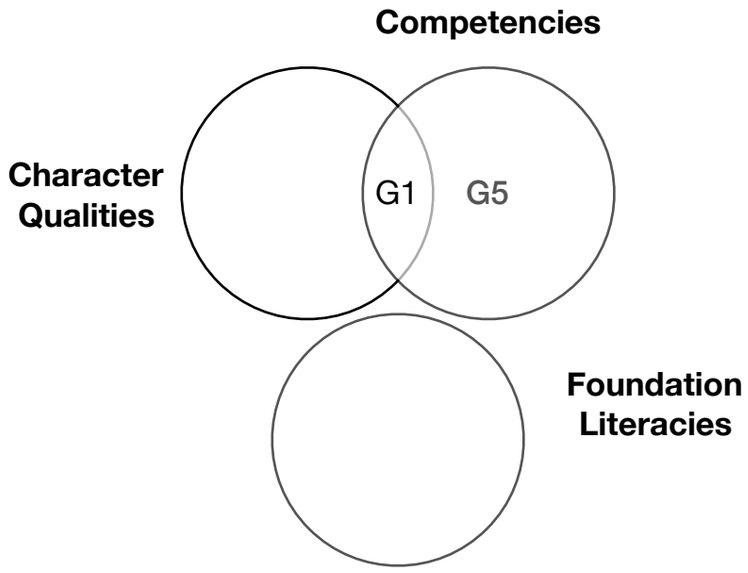
G8	Ability to carry out lifelong learning and continuous professional development	Persnl sk'l		Character Qualities
G9	Demonstrate problem solving abilities	Persnl sk'l	Values	Competencies
G12	Ability to demonstrate leadership attributes	Persnl sk'l	Social sk’l	Character Qualities
S1	Ability to demonstrate entrepreneurial attributes (creative, risk taking, resilient and innovative)	Persnl sk'l	Values	Character Qualities
S10	Ability to monitor the progress and quality of civil engineering works	Persnl sk'l	Values	Foundational Literacies
G6	Ability to think critically, reflectively and innovatively	Persnl sk'l		Competencies
S13	Ability to evaluate the impact of engineering decisions	Persnl sk’l	Values	Character Qualities + Competencies





Categorization According to the Cluster Used in the 21st Century Skills

G1	Ability to work collaboratively and effectively in diverse contexts	Social sk'l	Values	Character Qualities + Competencies
G5	Ability to communicate clearly and effectively	Social sk'l		Competencies



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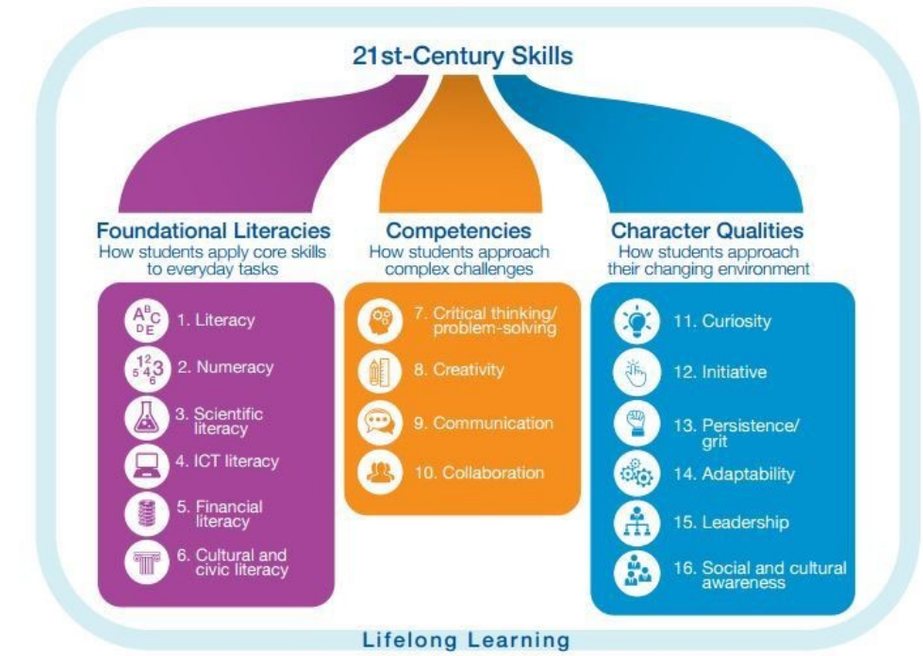

Note: ICT stands for information and communications technology.

G2	Ability to use information and communication technology purposefully and responsibly	Tech sk'l		Foundational Literacy
G10	Ability to initiate, plan, organise, implement and evaluate course of actions	Tech sk'l	Values	Character Qualities
G11	Ability to conduct research	Tech sk'l	Persnl sk’l	Competencies
G13	Ability to apply knowledge into practice	Tech sk'l	Values	Competencies
S2	Ability to show strong knowledge in science and mathematics (including statistics)	Tech sk'l		Foundational Literacy
S3	Ability to interpret engineering drawings	Tech sk'l	Persnl sk’l	Competencies
S4	Ability to create algorithm to solve engineering problems	Tech sk'l	Persnl sk’l	Foundational Literacy
S5	Ability to understand principles of material science	Tech sk'l		Foundational Literacy
S6	Ability to carry out civil engineering analysis	Tech sk'l	Persnl sk’l	Foundational Literacy
S7	Ability to interpret engineering data from testing	Tech sk'l	Persnl sk’l	Competencies
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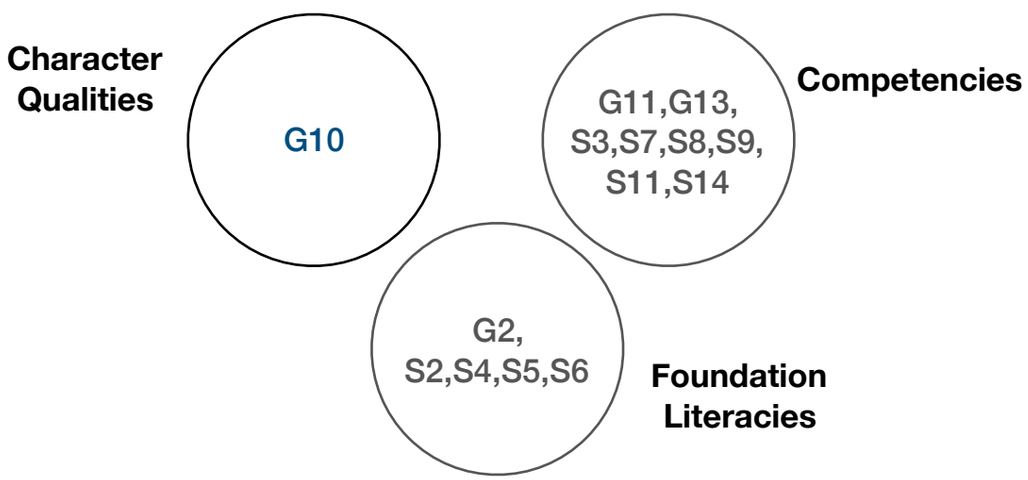
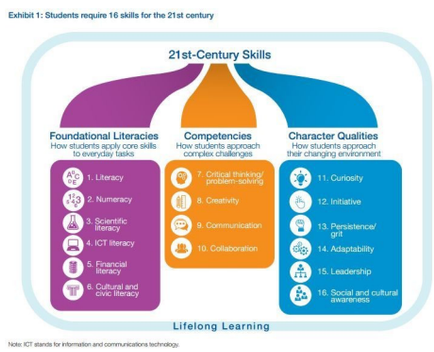
S9	Ability to design civil engineering elements (e.g : structural, geoTech, water, transport &highway, env engr, etc)	Tech sk'l		Competencies
S11	Ability to identify the appropriate construction technology and methods	Tech sk'l		Competencies
S14	Ability to integrate all civil engineering knowledge into a workable system	Tech sk'l	Persnl sk’l	Competencies

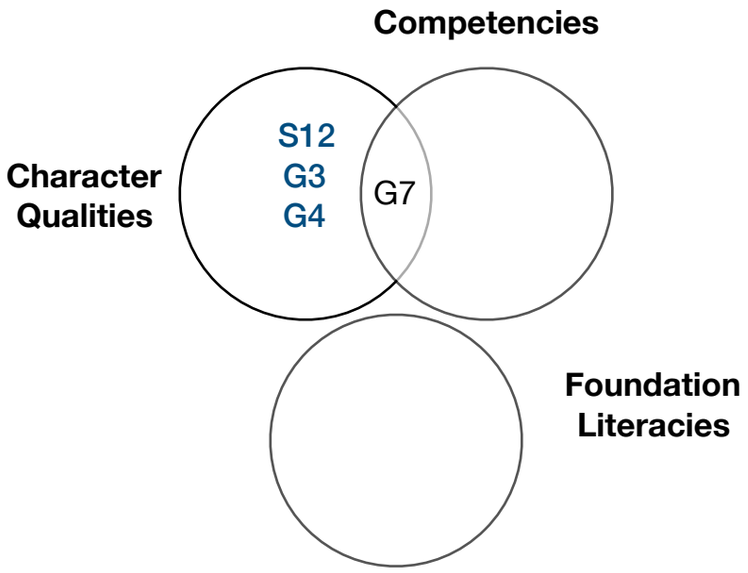


Categorization According to the Cluster Used in the 21st Century Skills



Categorization According to the Cluster Used in the 21st Century Skills

G7	Ability to understand, value, and respect diversity and multiculturalism	Values	Social sk'l	Competencies & Character qualities
S12	Ability to uphold safety	Values		Character qualities
G4	Ability to demonstrate responsibility and accountability towards the society and environment	Values		Character qualities
G3	Ability to uphold professional, moral and ethical values	Values		Character qualities



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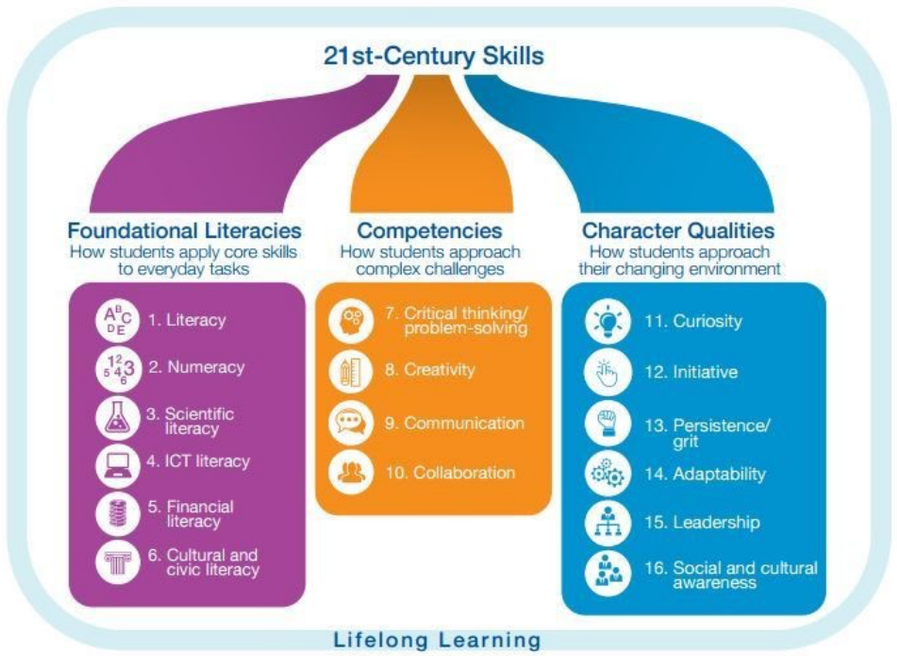

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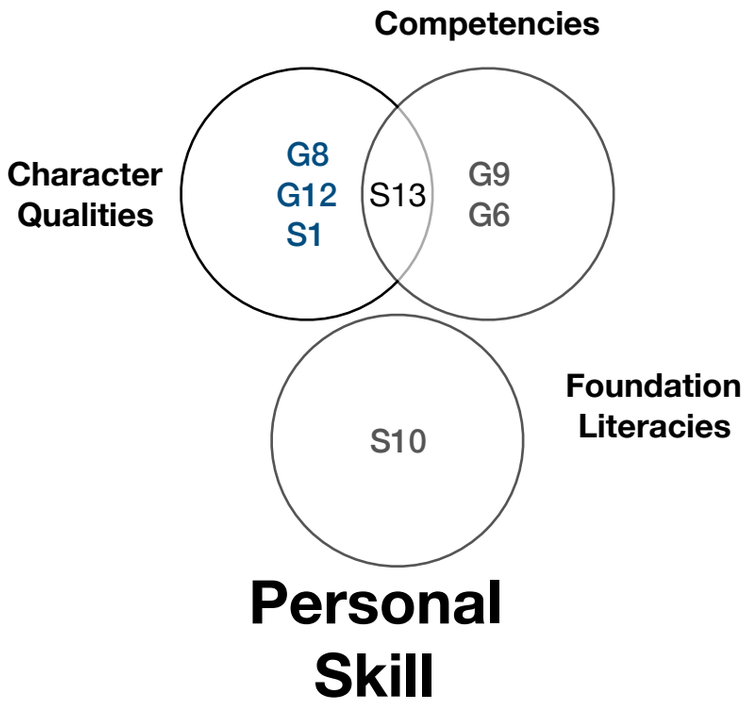
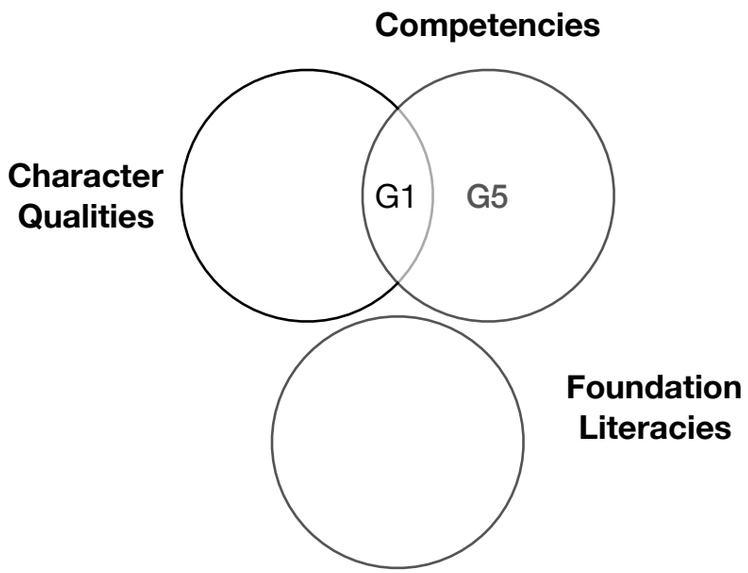
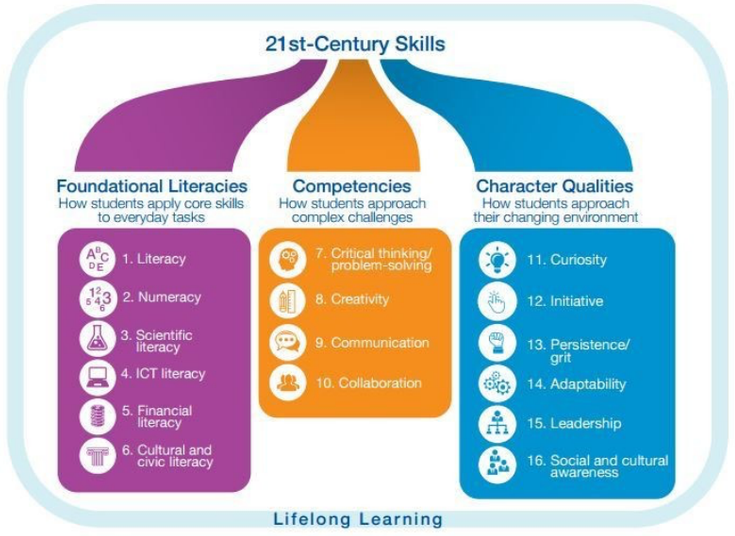


Personal Skill



Social Skill

Exhibit 1: Students require 16 skills for the 21st century



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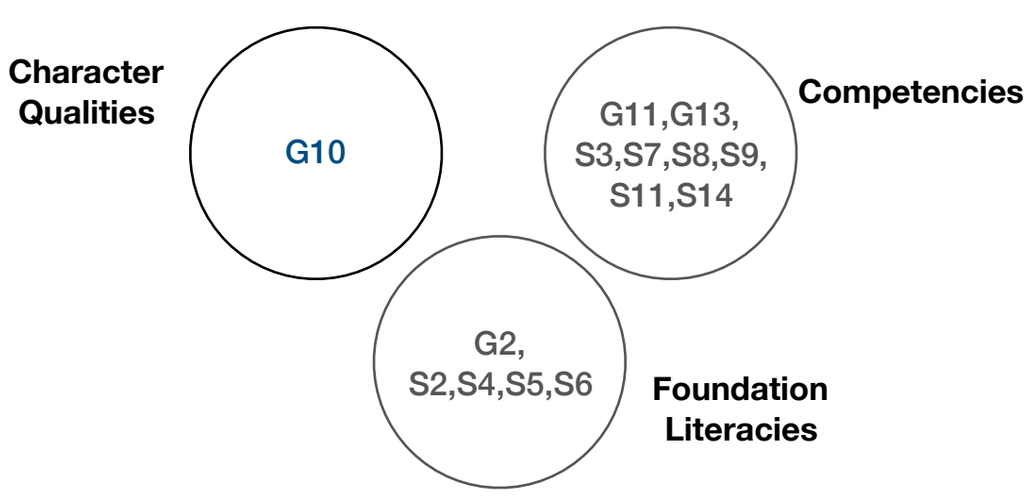
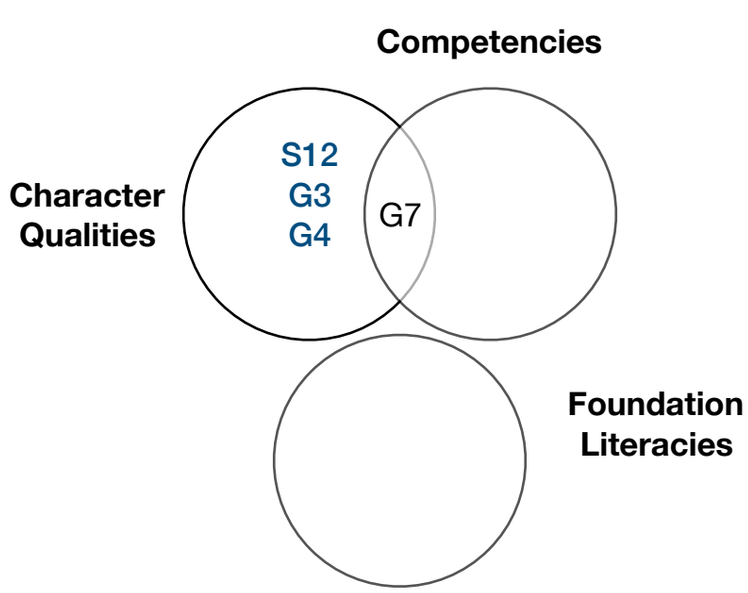
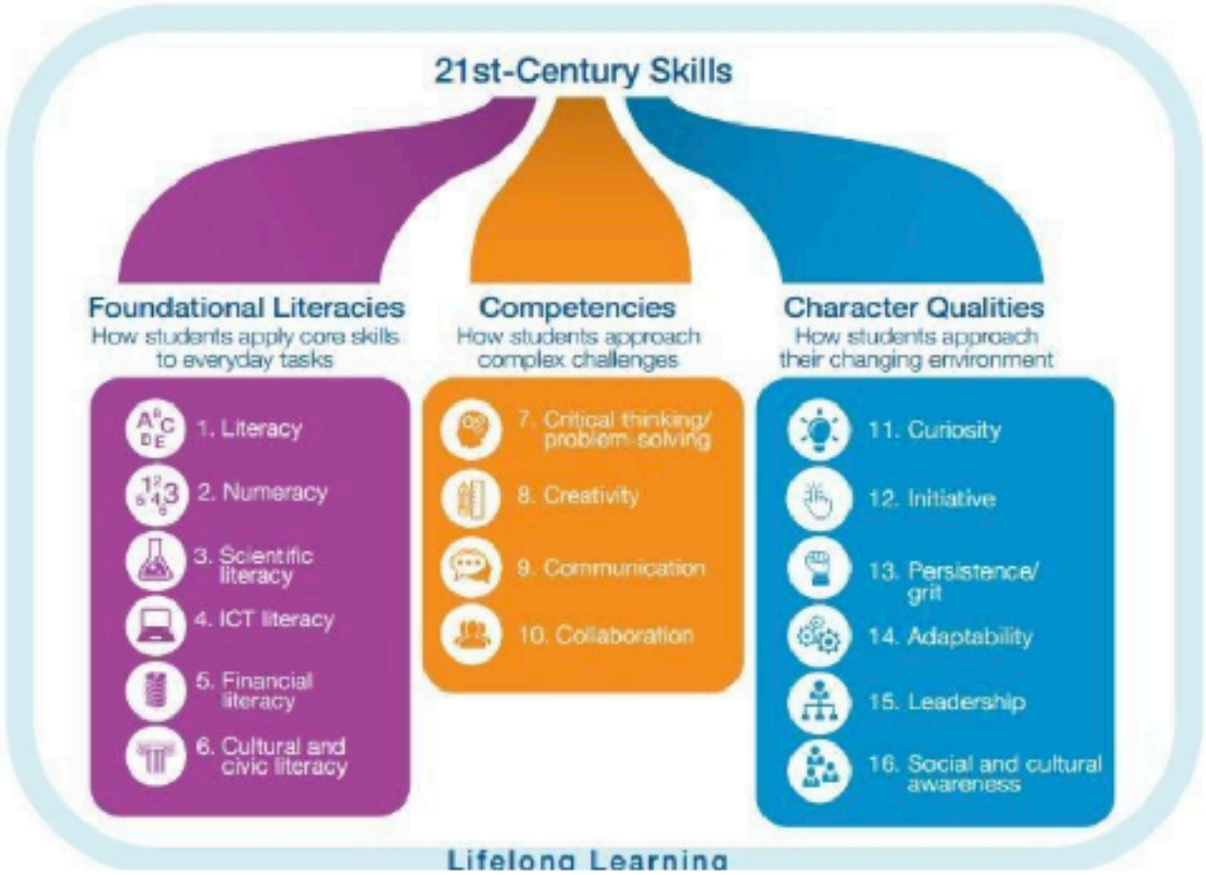
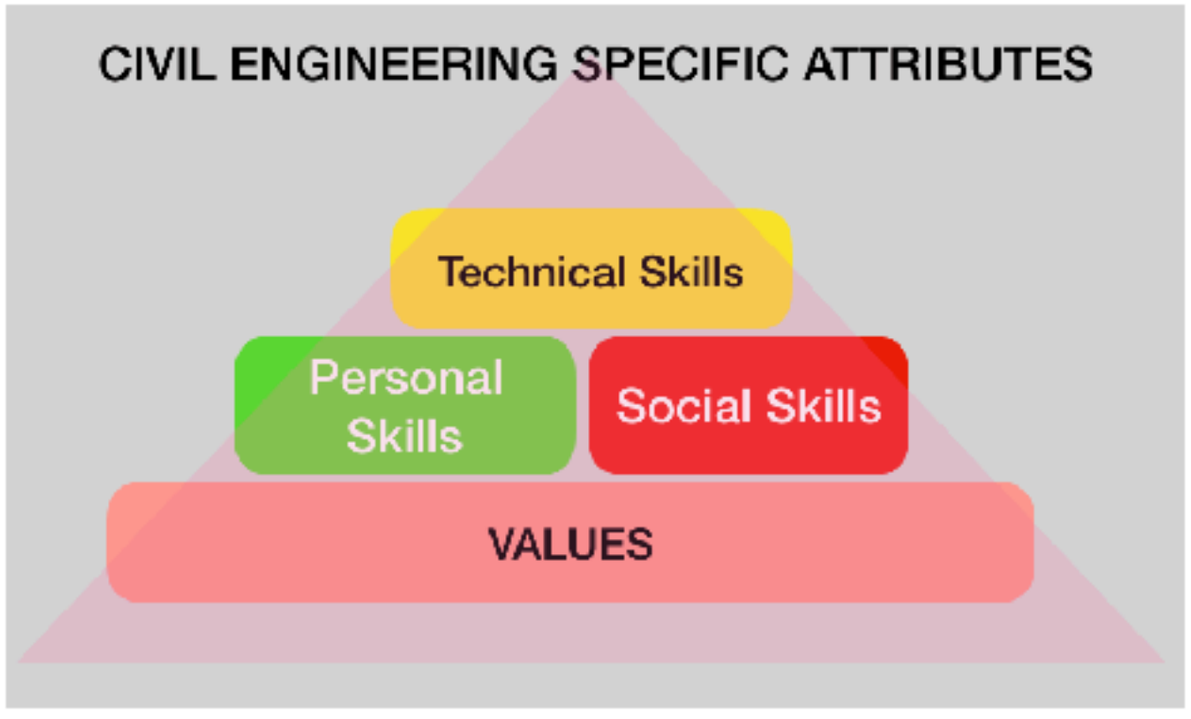


Technical Skill



Values


21st-Century Skills
Foundational Literacies
How students apply core skills to everyday tasks
1. Literacy
2. Numeracy
3. Scientific literacy
4. ICT literacy
5. Financial literacy
6. Cultural and civic literacy
Competencies
How students approach complex challenges
7. Critical thinking/ problem-solving
8. Creativity
9. Communication
10. Collaboration
Character Qualities
How students approach their changing environment
11. Curiosity
12. Initiative
13. Persistence/ grit
14. Adaptability
15. Leadership
16. Social and cultural awareness
Lifelong Learning

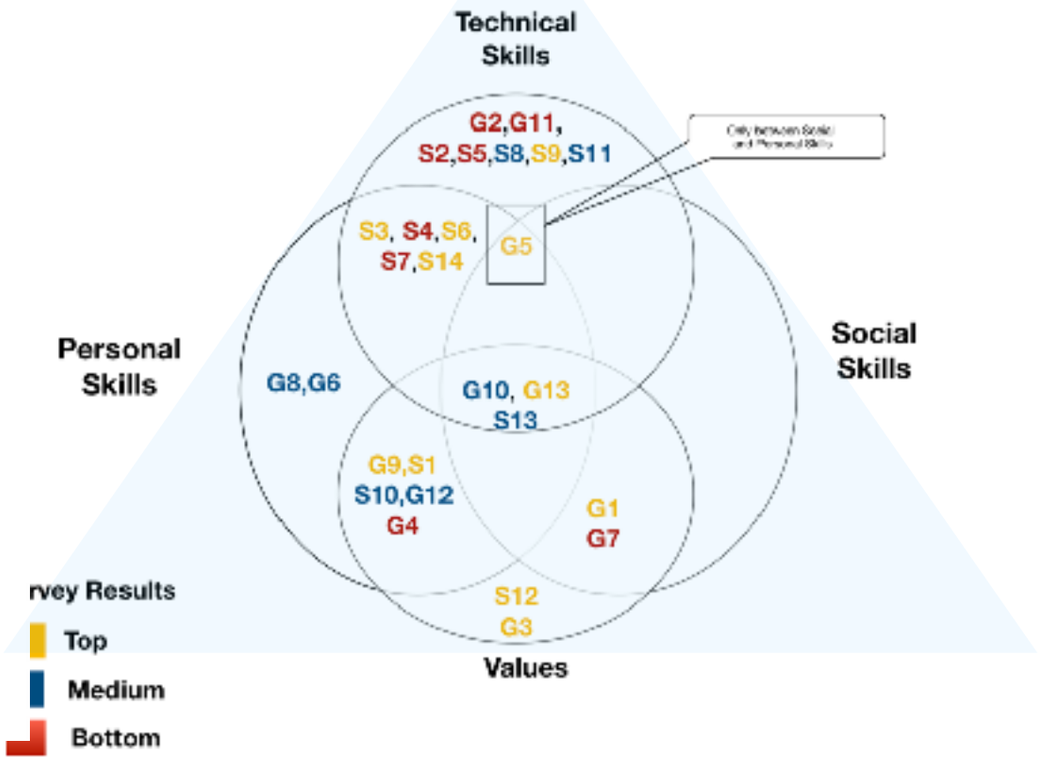

CIVIL ENGINEERING SPECIFIC ATTRIBUTES
Technical Skills
Personal Skills
Social Skills
VALUES


Competencies
Character Qualities
G8
G12
S1
S13
G9
G6
S10
Foundation Literacies
Personal Skill


Competencies
Character Qualities
G1
G5
Foundation Literacies
Social Skill


Character Qualities
G10
G11,G13, S3,S7,S8,S9, S11,S14
Competencies
G2, S2,S4,S5,S6
Foundation Literacies
Technical Skill

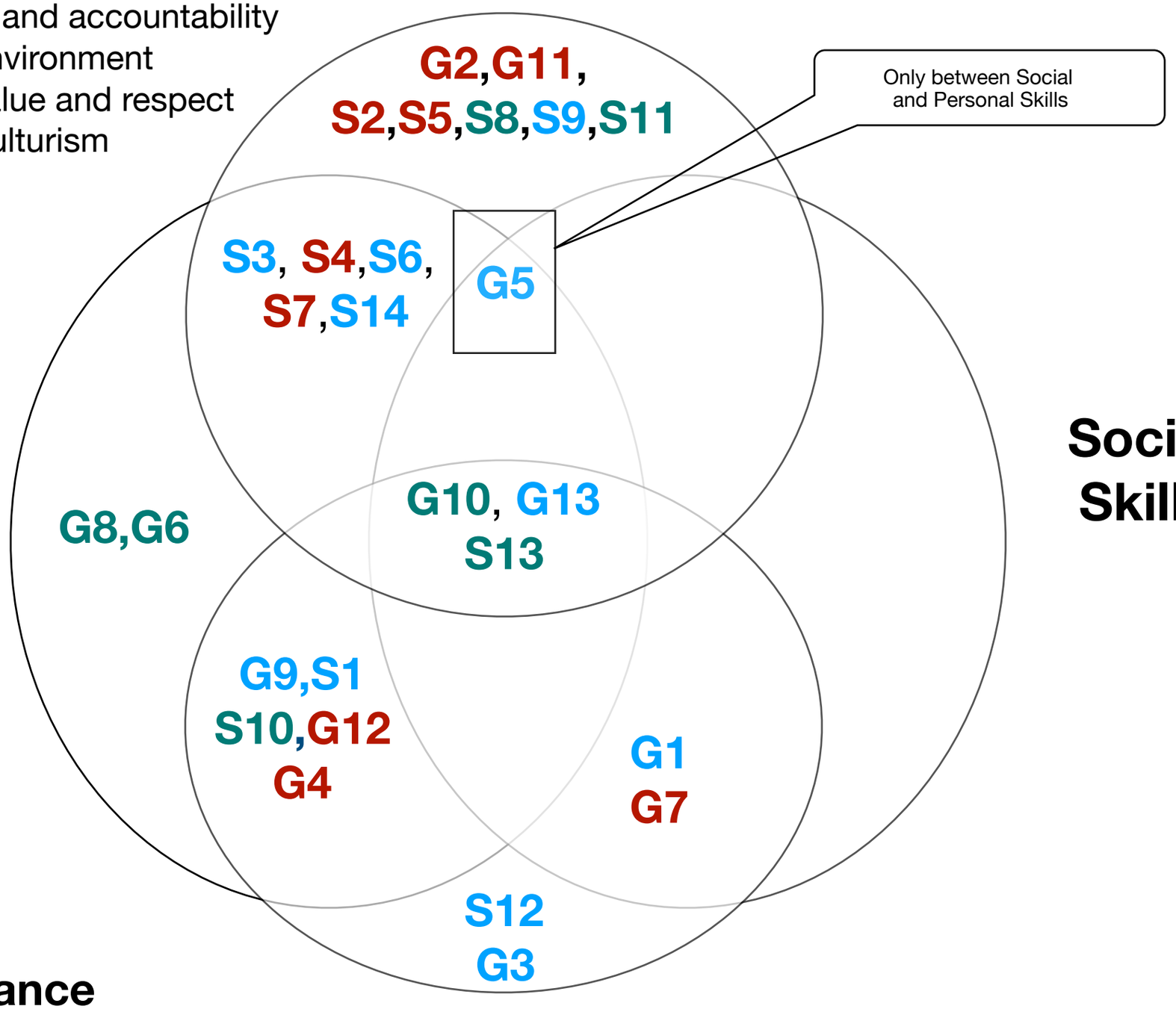

Competencies
Character Qualities
S12
G3
G4
G7
Foundation Literacies
Values


Technical Skills
G2,G11, S2,S5,S8,S9,S11
S3, S4,S6, S7,S14
G5
Personal Skills
Social Skills
G8,G6
G10, G13 S13
G9,S1 S10,G12 G4
G1 G7
S12 G3
Values
rvey Results
Top
Medium
Bottom

Categorization by skill-set + Values

Competencies across two domains

S4: Ability to create algorithm to solve problems
S7: Ability to interpret engineering data
G12: Demonstrate leadership attributes
G4: Demonstrate responsibility and accountability towards society and environment
G7: Ability to understand, value and respect diversity and multiculturism



Survey Results

- Top in importance
- Medium in importance
- Bottom in importance

Categorization by skill-set + Values

Competencies across two domains

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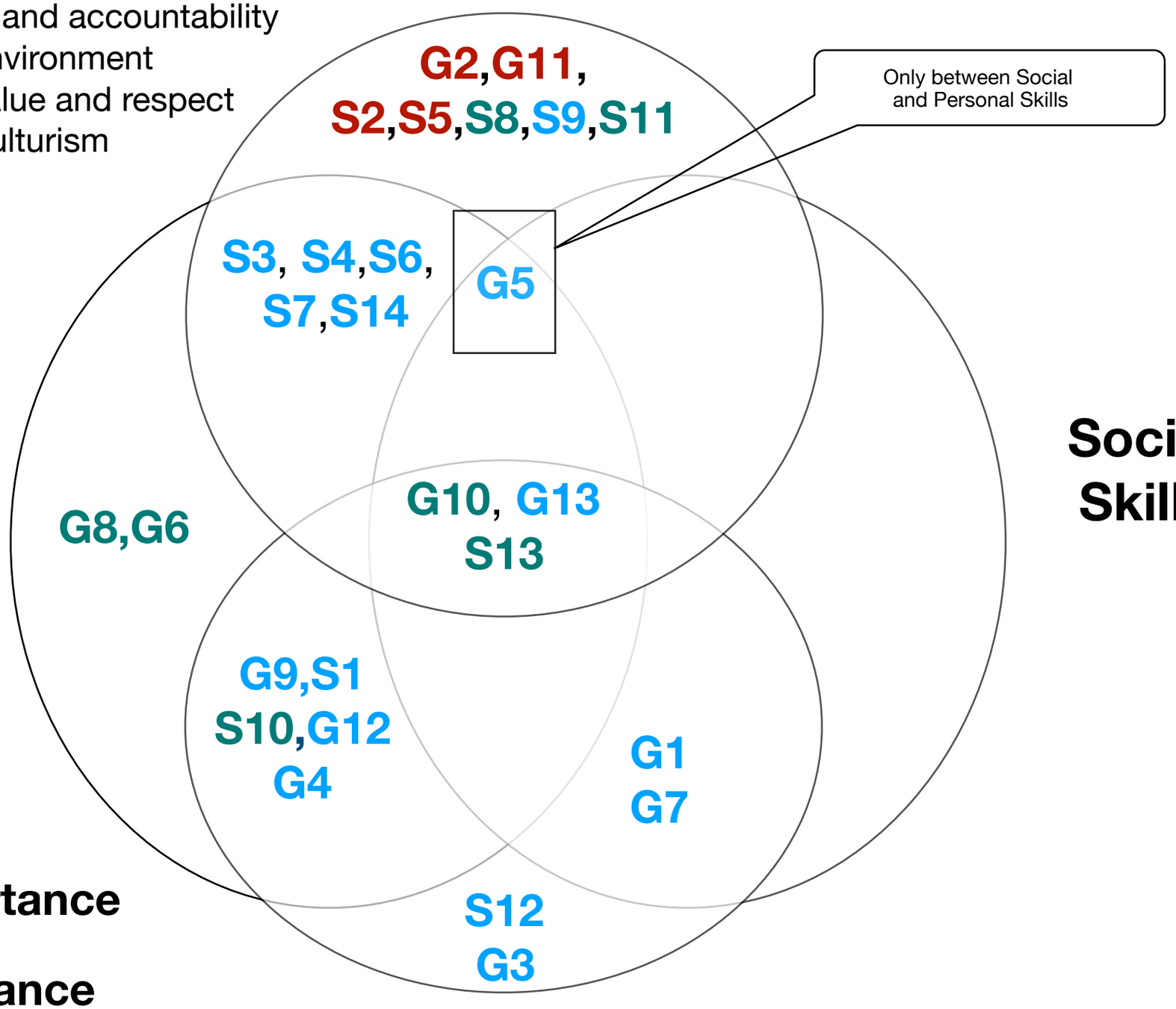
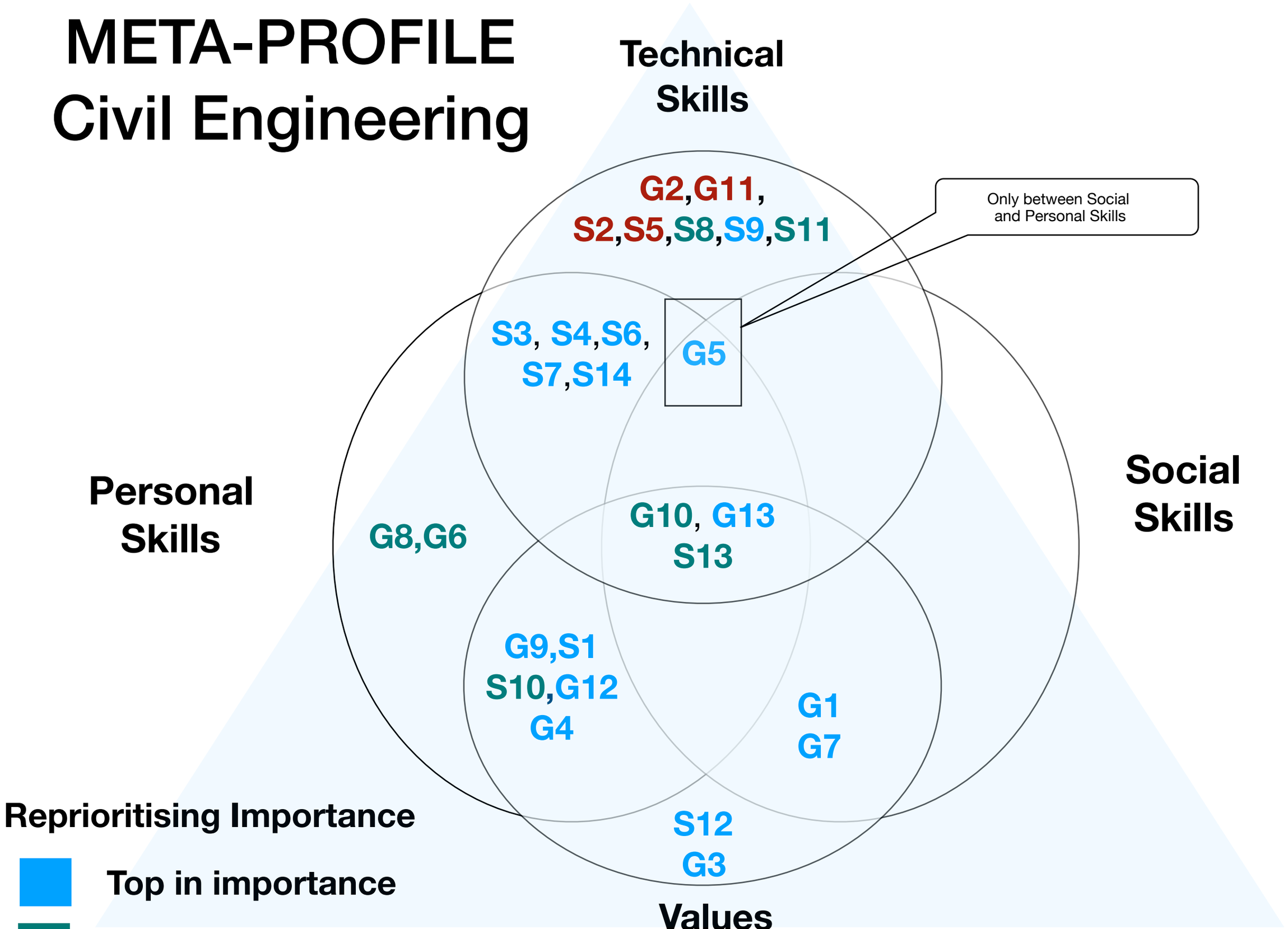


Reprioritising Importance

- Top in importance
- Medium in importance
- Bottom in importance

META-PROFILE
Civil Engineering



Reprioritising Importance

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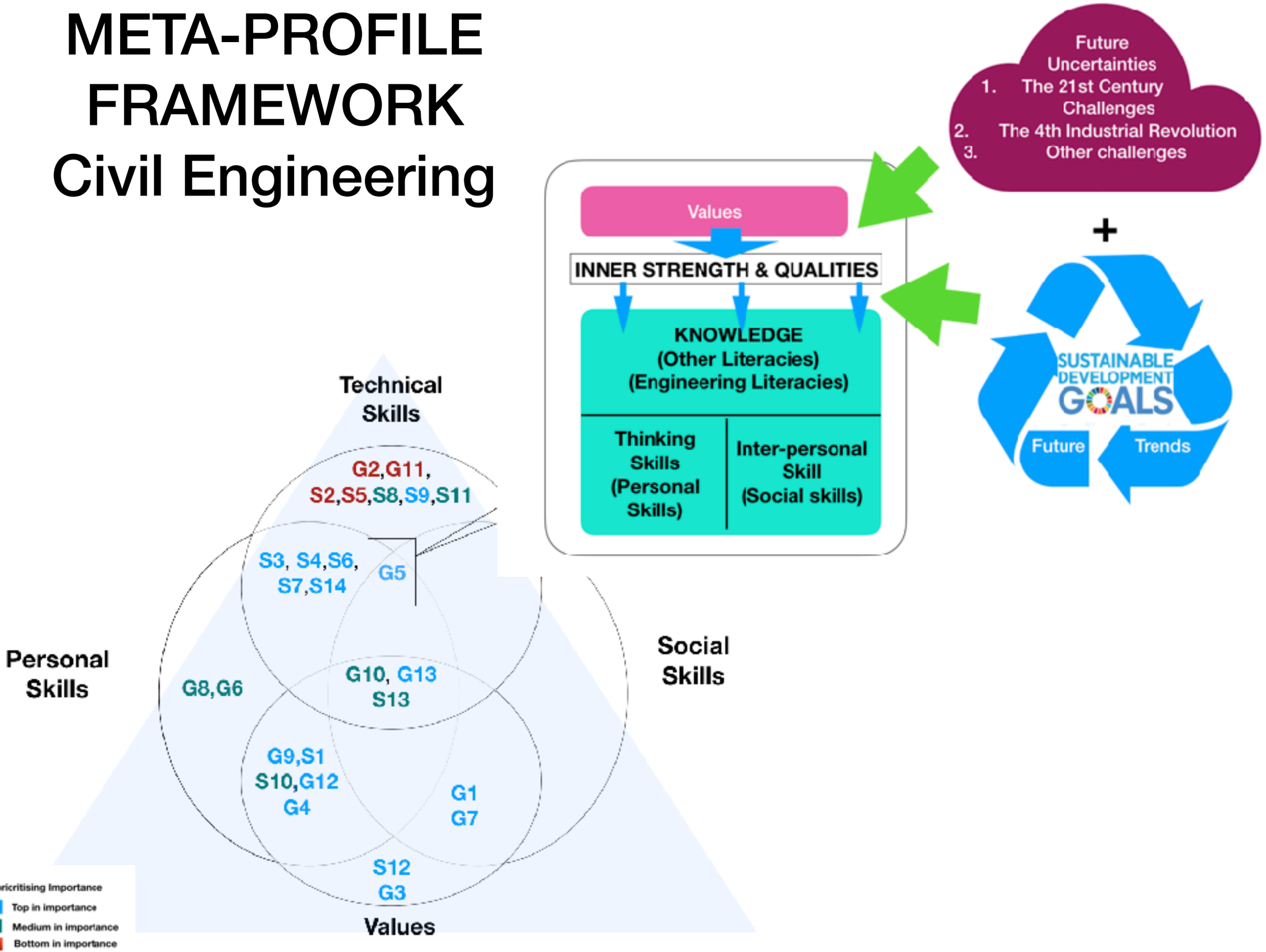
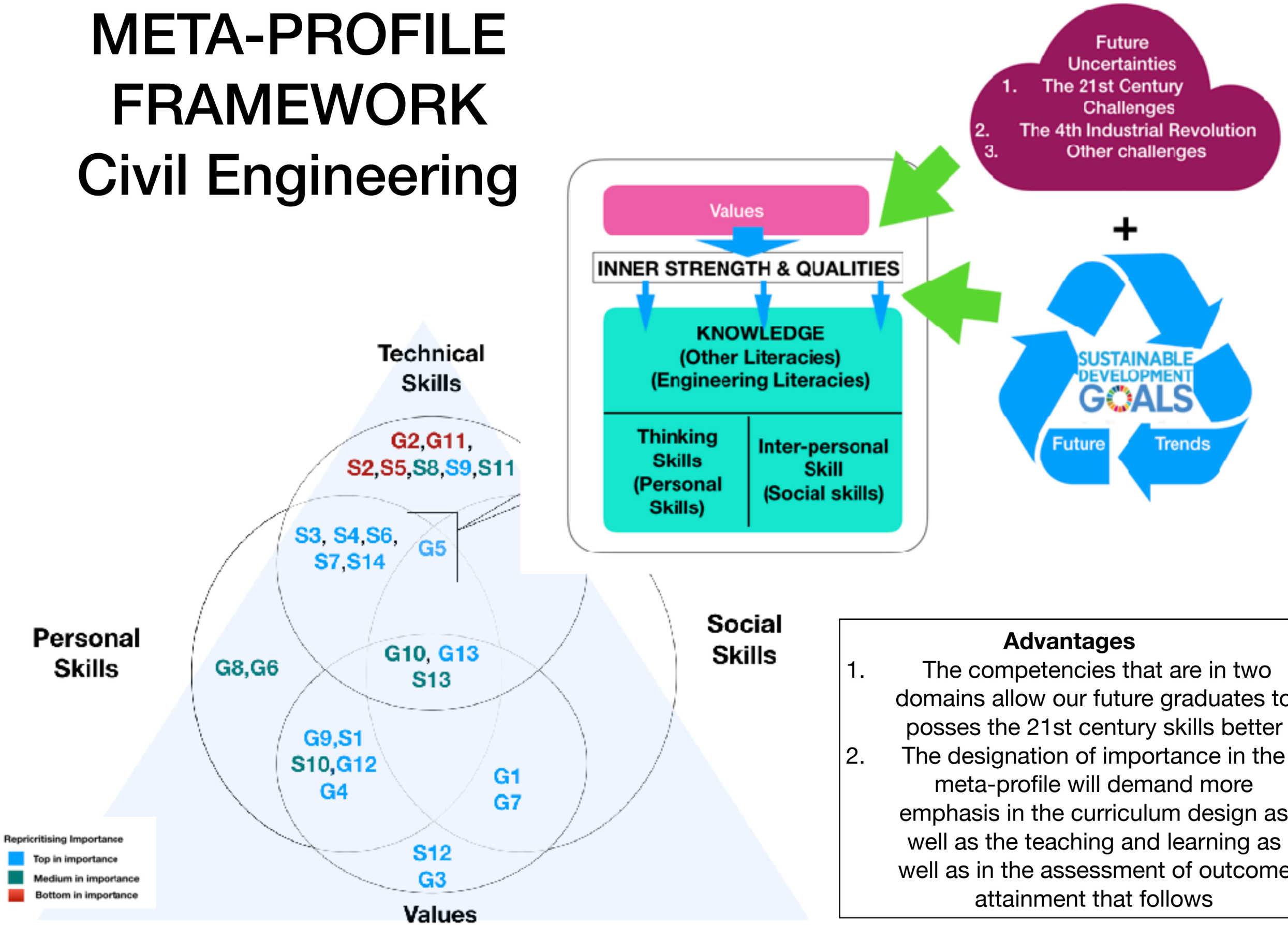
META-PROFILE FRAMEWORK
Civil Engineering



META-PROFILE FRAMEWORK
Civil Engineering



Advantages

1. The competencies that are in two domains allow our future graduates to posses the 21st century skills better
2. The designation of importance in the meta-profile will demand more emphasis in the curriculum design as well as the teaching and learning as well as in the assessment of outcome attainment that follows

Improvement on List of Generic Competencies

- Clarity in the expression of all competencies is important because they will be the outcomes to which a civil engineering curriculum design will be based

- Some ambiguity may have occurred due to poor expression of the competencies during the survey stage

- A revision of selected specific competencies was carried out.

- Competency; let it be generic or specific; with low rating/ranking should be revised its level of importance by benchmarking with 21st century civil engineering attribute, 4th industrial revolution and sustainable development goal (SDG).

- The purpose of the revision is to make the proposed meta-profile of competency relevant for current and future needs

Original	1	Ability to demonstrate entrepreneurial attributes (creative, risk taking, resilient and innovative) – transferred from the original generic competency
	2	Ability to show strong knowledge in science and mathematics (including statistics)
	3	Ability to interpret engineering drawings
	4	Ability to create algorithm to solve engineering problems
	5	Ability to understand principles of material science
	6	Ability to carry out civil engineering analysis
Subject specific competences - Civil Engineering	7	Ability to interpret engineering data from testing
	8	Ability to utilise relevant design codes and regulations
	9	Ability to design civil engineering elements (e.g.: structural, geotechnical, water, transportation and highway, environmental engineering, and others)
	10	Ability to monitor the progress and quality of civil engineering works
	11	Ability to identify the appropriate construction technology and methods
	12	Ability to uphold safety
	13	Ability to evaluate the impact of engineering decisions
	14	Ability to integrate all civil engineering knowledge into a workable system

SPECIFIC COMPETENCIES (Improved)

1. Ability to show resilience
2. Ability to utilize knowledge in science and mathematics (including statistics)
3. Ability to interpret engineering drawings
4. Ability to create processes to solve engineering problems
5. Ability to apply the knowledge of material science
6. Ability to carry out civil engineering analysis
7. Ability to interpret engineering data
8. Ability to utilise relevant design codes and regulations
9. Ability to design civil engineering elements (e.g : structural, geotechnical, water, transportation and highway, environmental engineering, and others)
10. Ability to monitor the progress and quality of civil engineering works
11. Ability to identify the appropriate construction technology and methods
12. Ability to uphold safety
13. Ability to evaluate the impact of engineering decisions
14. Ability to integrate all civil engineering knowledge into a workable system

Original	1	Ability to work collaboratively and effectively in diverse contexts
	2	Ability to use information and communication technology purposefully and responsibly
	3	Ability to uphold professional, moral and ethical values
	4	Ability to demonstrate responsibility and accountability towards the society and environment
	5	Ability to communicate clearly and effectively
	6	Ability to think critically, reflectively and innovatively
Generic competences	7	Ability to understand, value, and respect diversity and multiculturalism
	8	Ability to carry out lifelong learning and continuous professional development
	9	Demonstrate problem solving abilities
	10	Ability to initiate, plan, organise, implement and evaluate course of actions
	11	Ability to conduct research
	12	Ability to demonstrate leadership attributes
	13	Ability to apply knowledge into practice

THANK YOU
From the Civil Engineering SAG

"See you in Surabaya"