Teaching the SDGs for Enhancing the Education at the University

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ABSTRACT: The SDSN document "Accelerating Education for the SDGs in Universities" 2020, encourages Universities to take the initiative to teach, to practice and to support the advancement of the Sustainable Development Goals (SDGs) in each country.
This article is about teaching the SDGs in the professional education and practice from the point of view of the more deprived because of the SDGs' principle of "Leave No One Behind" and the field of project management, which is part of most carriers.
The objective of the class is to facilitate students the understanding of the diversity and holistic of the SDGs and the kind of uses we all can make of them as a metrics, as a vocabulary or as a framework in our professional or daily life and the role that every person can take as a participant, an observer, or a coordinator.
To start the semester, The Bloom's Taxonomy is explained for the importance of the second level of knowledge of analysis, evaluation, and creation.
The technique that it is employed has been adapted from the method "Seven Steps to SDG Sensemaking" of the City of Espoo, Finland, 2021 and it is worked by groups of 5 students. The groups of students search the information of the SDGs in the "Municipal Atlas of the SDGs in Bolivia", 2020, selecting one SDG per student according to their interest and carrier.
The tasks of the semester are based on a matrix that has in the columns the locations where the Atlas provides information at local level an n the rows the program sectors.
We propose to include this exercise within a Project Management semester course, where the students learn to formulate seven static data bases or planning tools. The information of these tools will be used in a simulation of the implementation of the project for monitoring the advances of the indicators toward the targets.
The improvements of this method comparing with other methods are the inclusion in the monitoring of intermediate and long-term results with change and impact indicators, the qualification of the advances to facilitate the comparison between indicators of different programs, the understanding of a non-linear approach to the scope of the project, and the preparation of real-time executive dashboards.
Finally, we suggest including local resilience indicators in the method, to make sure that the principle of "Leave No One Behind" of the 2030 UN Agenda is employed.

1. Introduction

Last year I presented an article[1], where first a method for project planning, monitoring and learning in development and emergencies is explained and also the need to include the SDG 2030 and Local Resilience indicators is suggested. Now, in this article I would like to describe a way to teach at the university the SDGs based on the method of the city of

[1] Francisco J.A. Guachalla, "Embracing the SDG 2030 and Resilience for Monitoring and Learning in Emergency and Developing Projects". Med. Sci. Forum 2023, 19, 6. https://doi.org/10.3390/msf2023019006.

Espoo in Finland, 2021[2] and the approach how this information can be included in project planning, monitoring, and learning for development and emergencies.

2. Teaching the SDGs at the University

2.1 The Taxonomy of Bloom

The Bloom's Taxonomy[3] in Figure 1 is explained first to the students, to make sure that they want to reach the second level of knowledge, which is analysis, evaluation and maybe even creation of tools to use the SDGs instead to stay in the first level of knowledge of remembering, understanding and application of the SDGs only, as long as they are learning at the university. The Taxonomy of Bloom will serve to make clear the high level of achievement that is pursued in the course to use the tools of the SDGs in their professional and daily life.

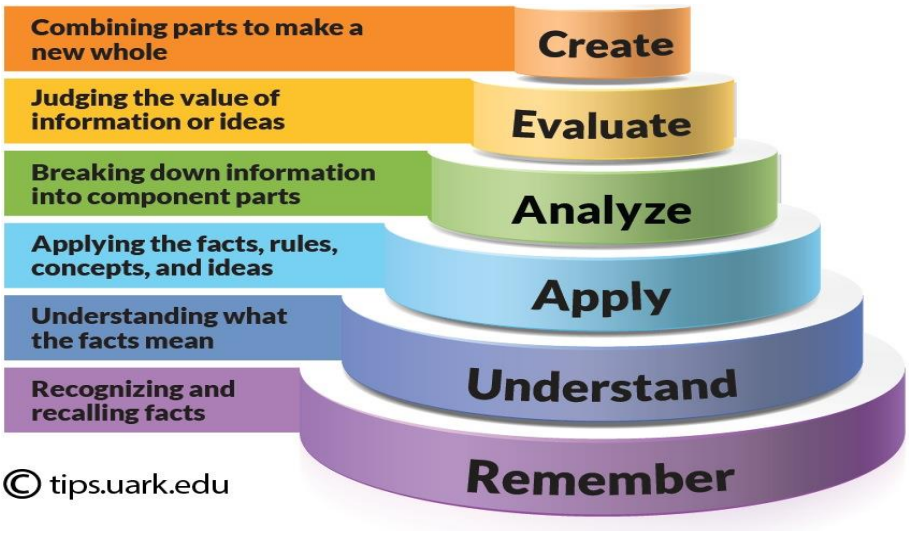

Figure 1 The Taxonomy of Bloom
www.tips.uark.edu

2.2 Seven Matrixes to Use the SDGs

Introduction to the SDG 2030
The UN Agenda 2030[4] was signed by 193 countries on September 25th, 2015, in NY and contains 17 Sustainable Development Goals (SDG) (Figure 2) with 169 targets, organized in five groups: People (SDGs 1 to 5) – Planet (SDGs 6, and 12 to 15) – Prosperity (SDGs 7 to 11) – Peace (SDG 16) – Partnership (SDG 17).

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[2] City of Espoo, Finland. "Seven Steps to SDG Sensemaking". 2021.
[3] Benjamin S. Bloom et. al., "Taxonomy of educational objectives: The classification of educational goals" Vol. Handbook I: Cognitive domain. New York: David McKay Company, 1956. https://en.wikipedia.org/wiki/Bloom%27s_taxonomy.
[4] UN Resolution. "Transforming our World: The 2030 Agenda for Sustainable Development"; United Nations: New York, NY, USA, 2015. https://sdgs.un.org/2030agenda.

Figure 2 The seventeen Sustainable Development Goals of the UN Agenda 2030

Groups of 3 to 5 students search in the Bolivian Municipal Atlas of the SDGs[5] the information of the SDGs they are interested to study and fill out 7 matrixes adapted from the method. The basic matrix in Figure 3 has in the columns the headings: municipality - intermediate city – capital – department – country and in the rows, the program sectors: economic – social – environmental – institutional – cultural. The groups also include the number of the page of each location in the Atlas to facilitate the review.

The basic matrix is filled by the groups with the information of the selected SDGs in the following order:

- Matrix 1: The SDG indexes (value and qualification with color) located according to the geographic importance and program sector with the name of each student.
- Matrix 2: The students choose a target for each SDG with units of magnitude. Each target is valid for the entire country.
- Matrix 3: includes the value of selected indicators with units like the targets and qualification with color. Each student finds the values of the selected indicator for the five locations.
- Matrix 4: calculates the difference between the target and the indicator, which is the amount of work needed to reach the target by 2030 in each location.
- Matrix 5: calculates the work needed annually, dividing the values of matrix 4 by the number of years until 2030.
- Matrix 6: multiplies the annual work by the number of people to be reached to attain the target by 2030 in all locations.
- Matrix 7: shows the roles students would implement in the future whether as coordinator, participant or observer and the way to use the lessons of this course as framework, metric, or vocabulary

[5] Lykke E. Andersen, et. al., "Atlas municipal de los Objetivos de Desarrollo Sostenible en Bolivia 2020". La Paz: Universidad Privada Boliviana, SDSN Bolivia, 2020. www.sdsnbolivia.org/Atlas.

In the following compound Figure 3 of five tables, there is an example of the semester work of one group for the department of Beni in Bolivia.

Base Matrix

Location / Sector	Municipality San Borja (385)	Intermediate City Riberalta (382)	Capital City Trinidad (380)	Department Beni (64)	Country Bolivia (55)
Social					
Economic					
Environment					
Institutional					
Cultural					

Matrix 1. SDG Indexes of the Group 3

Location / Sector	Municipality San Borja (385)	Intermediate City Riberalta (382)	Capital City Trinidad (380)	Department Beni (64)	Country Bolivia (55)
Social		4 EDUCACIÓN DE CALIDAD 22% Víctor Mier Villegas			
Economic	8 TRABAJO DECENTE Y CRECIMIENTO ECONÓMICO 52% Andrea Fernández Angulo				
Environment			15 VIDA DE ECOSISTEMAS TERRESTRES 41% Melany Añez Moreno		6 AGUA LIMPIA Y SANEAMIENTO 56% Agata Segales Vera
Institutional					
Cultural				11 CIUDADES Y COMUNIDADES SOSTENIBLES 42% Roberto Hurtado De Mendoza Ayala	

Information of SDG 4 from the Matrixes 2 to 5

Information of matrixes / Location	Municipality San Borja (385)		Intermediate City Riberalta (382)		Capital City Trinidad (380)		Department Beni (64)		Country Bolivia (55)	
TARGET (matrix 2)	Target 4.1: Ensure that all girls (100%) and all boys (100%) end the primary and secondary									
Indicator: (matrix 3) Abandonment rate in secondary, Men (M), 2017 (% registered) Abandonment rate in secondary, Women (W), 2017 (% registered)	8,6 M	6,1 W	8,6 M	6,5 W	6,1 M	4,9 W	7,5 M	5,9 W	4,6 M	3,0 W
Difference to 2030 (%) (matrix 4)	8,6	6,1	8,6	6,5	6,1	4,9	7,5	5,9	4,6	3,0
Annual work (dividing by 7 years until 2030) (%) (matrix 5)	1,23	0,87	1,23	0,93	0,87	0,7	1,07	0,84	0,66	0,43

Matrix 6: Annual Work per Population to reach Target 4.1

Location	Municipality San Borja (385)		Intermediate City Riberalta (382)		Capital City Trinidad (380)		Department Beni (64)		Country Bolivia (55)	
POPULATION (12-18 YEARS) MEN (M) WOMEN (W)	3.542		9.463		18.255		40.143		165.043	
	2196 (M) (62%)	1346 (W) (38%)	4069 (M) (43%)	5394 (W) (57%)	8762 (M) (48%)	9493 (W) (52%)	21276 (M) (53%)	18867(W) (47%)	89123 (M) (54%)	75920 (W) (46%)
TARGET	Target 4.1: Ensure that all girls (100%) and all boys (100%) end the primary and secondary									
NUMBER OF MEN AND WOMEN HAVE TO AVOID TO ABANDON SECUNDARY PER YEAR UNTIL 2030	1,23% 27 (M)	0,87% 12 (W)	1,23% 50 (M)	0,93% 50 (W)	0,87% 76 (M)	0,7% 66 (W)	1,07% 228 (M)	0,84% 158 (W)	0,66% 588 (M)	0,43% 326 (W)

Matrix 7: Role and Use of the SDG in Professional Life

	OBSERVER	PARTICIPANT	COORDINATOR
METRIC			I will present a project to the major of Trinidad, Mr. Christian Cámara, showing the rate of abandonment of men and women in secondary with the information in Matrix 6 of 534 M (6.1%) and 465 W (4.9%) to reach until 2030 a rate of "0" abandonment in secondary. That means 76 M (0.87%) and 66 W (0.7%) per year that go back in school.
FRAMEWORK		I would participate in an education project in Trinidad measuring the indicators of SDG 4: • Rate of abandonment in secondary (% M, % W) • Rate of abandonment in primary (% boys, % girls)	The project of early detection will identify the risk students to abandon to support with individual tutorial, recovery classes, summer program, personal academic advice, and close monitoring of academic and emotional student progress
VOCABULARY	I would talk with my colleagues and docent at the University about the importance of SDG 4 Quality Education in general and in Trinidad about the rate of abandonment of men and women of the school.		

Figure 3 Example of Information of Matrices 1 to 7
Adapted and Translated by F. Guachalla based on the Exercise of one Group. 2023

3. Inserting SDGs' Indicators into the Dynamic Monitoring System

In the first article (1) we find in page 7 an example of the Executive Dashboard similar to the one in Figure 4 with the information of advances achieved by outcomes and output-indicators. The example is to improve the Health of Children in Communities through a water-sanitation-hygiene (WASH) project and shows the qualification of results and their curves. The dashboard in 2-pages is the result of the dynamic project monitoring system developed by each working group, which we exercise for the simulation of one year project implementation at the University. In the Project Management course they learn to plan and monitor the indicators of a project using the information of the seven planning tools, the targets and the elapsed project time.

In summary the seven planning tools are: Project Cycle, Geo-population List/Map, Logical Framework, Outcome Mapping LF-Tree, Timetable with emphasis in the Outcomes, Personal Chart for accountability purposes and Budget. These provide the data for starting a simulation to learn to monitor the advances of different kind of indicators, as follows:

- Process indicators for monitoring advances of activities with high frequency (weekly or bi-weekly).
- Product indicators for monitoring the advances of outputs every month.
- Change indicators for monitoring the advances of intermediate results – outcomes quarterly.
- Impact indicators for monitoring the semester or annual advances of the specific objective with low frequency.

The high and low frequency for monitoring the indicators depends on the periods of significant changes of each level of indicator. It is usual for project teams to have weekly meetings to analyze the advances of activities; however, outcome indicators will have a significant advance in longer periods of time, we use quarters for the exercise to measure them and for impact indicators semester or even yearly periods.

In the first part of Figure 4, we see the qualification chart that can be adjusted according to the criteria to measure the advances of the indicators of a project. This qualification task serves to compare between sectors or programs and outcomes in an objectively way.

Qualification chart			
Rank	Qualification		Limits
>90%	V. Good	5	90%
70-90	Good	4	70%
50-70	Regular	3	50%
25-50	Low	2	25%
<25	V. Low	1	

	Q1	Q2	Q3	Q4	Target		
IR 1	200	450	400	800	850	Families	
IR 2	300	750	650	1000	1000	Children	
SDG 6.1	300	700	650	1350	1600	Families	
SDG 4.1	10	45	35	60	60	Sr.Stud	
IR 3	300	680	580	720	723	Schoolars	
	Y1	Y2	Y3	Y4	Y5	Target	
SDG 3.2	30	80	180	310	460	487	survive < 5yrs
SDG 7.2	100	250	500	800	1000	1000	w. clean energy
SDG 11.1	70	170	370	620	895	1000	not in slums
SDG 16.5	75	175	300	450	500	500	w. certificate

Figure 4 Results of the Insertion of SDG Indicators in the Project Executive Report (first part)

In Figure 4 (first part) right upper corner, we have the numeric part of the executive dashboard with results of a year of monitoring the IR indicators (1 to 3) plus the SDGs 6.1 and 4.1, while in the lower right part, we have the yearly changes of the indicators SDG 3.2, SDG 7.2, SDG 11.1 and SDG 16.5 in a period of five years. The difference between the monitoring periods is due to the expected changes of each indicator.

In Figure 4 (second part), there are the final values of the indicators of IR 1, IR 2, SDG 6.1, SDG 4.1 and IR 3 after one year simulation showing the level of achievement in the qualification column. Below this chart there are the outcomes IR 1 to 3 with the final values of the corresponding outputs (Pi,j) and the level of achievement in the column of qualification.

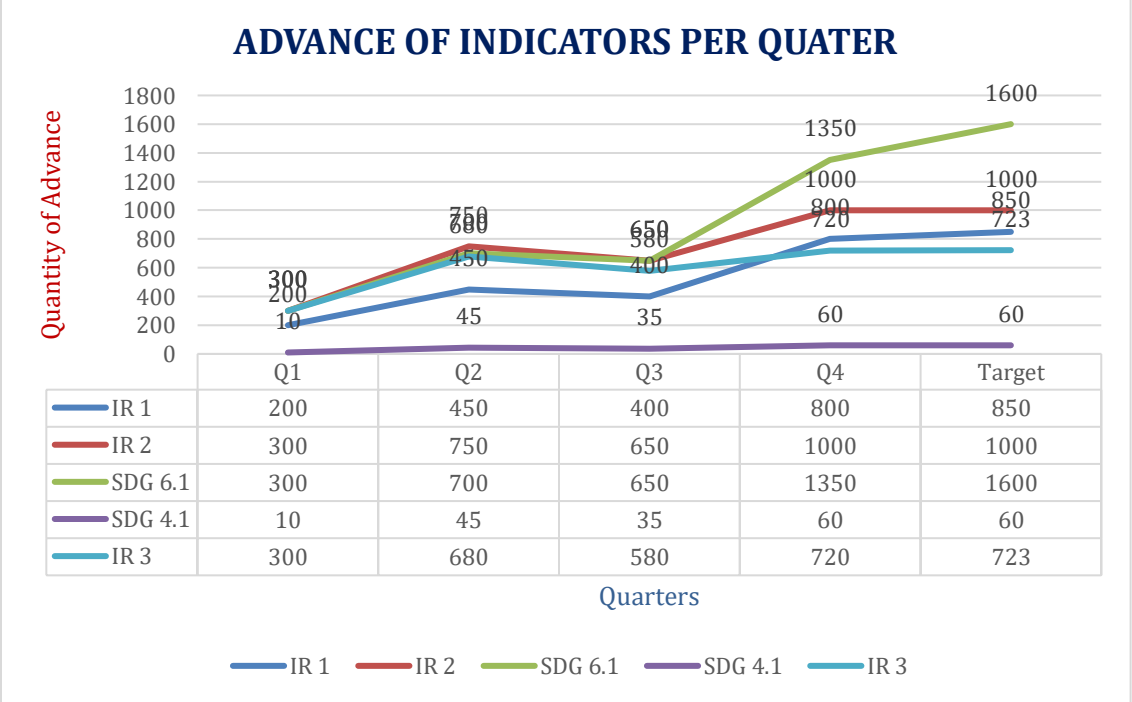
PROJECT EXECUTIVE REPORT

No.Rep	2			Imple	to present	Target	%	Qualification	
Rep.dat	30/12/22		OE	Childr	750	1400	54%	3	
Start:	1/1/2022								
Time:	363	days	IR 1	Famili	650	850	76%	4	650 of 850 (76%) Families w. better habits of (10 indicators)
			IR 2	Childr	1100	1600	69%	3	1100 children of 1000 families with new hygiene habi
			SDG 6.	Famil	1000	1000	100%	5	families of 12 districts use properly the water service
			SDG 4.	Sr.Stu	60	60	100%	5	60 senior students (100%) of 6 schools end the secondary
			IR 3	Schoo	680	723	94%	5	680 schoolchildren of 6 schools w. new hygiene habits at home

	current	Total	%	Qualification	
IR 1.	families of 12 districts fulfill new habits of sustainability of their water services				
P 1.1	900	950	95%	5	900 of 950 (95%) Families understand new better hygiene habits, (7 indicators).
P 1.2	12	12	99%	5	12 water committees fulfill the A-O-M tasks in 10 of 12 monthly tasks
P 1.3	630	900	70%	3	630 of 900 Families (70%) know about the waterfee for O&M of the A&S systems
IR 2	children of 1000 families wash their hands BE+AB				
P 2.1	1.450	1800	81%	4	children of 1000 families know about new hygiene habits
P 2.2	1.600	1800	89%	4	children of 1000 families know to take care of the water systems
IR 3	schoolchildren of 6 schools know about new hygiene habits and to take care of the water system				
P 3.1	575	765	75%	4	schoolchildren of 6 schools know about new hygiene habits
P 3.2	14	16	85%	4	teachers practice hygiene habits and to take of the water services in 6 schools
P 3.3	750	808	93%	5	schoolchildren of 6 schools know to take care of the water services in 6 schools

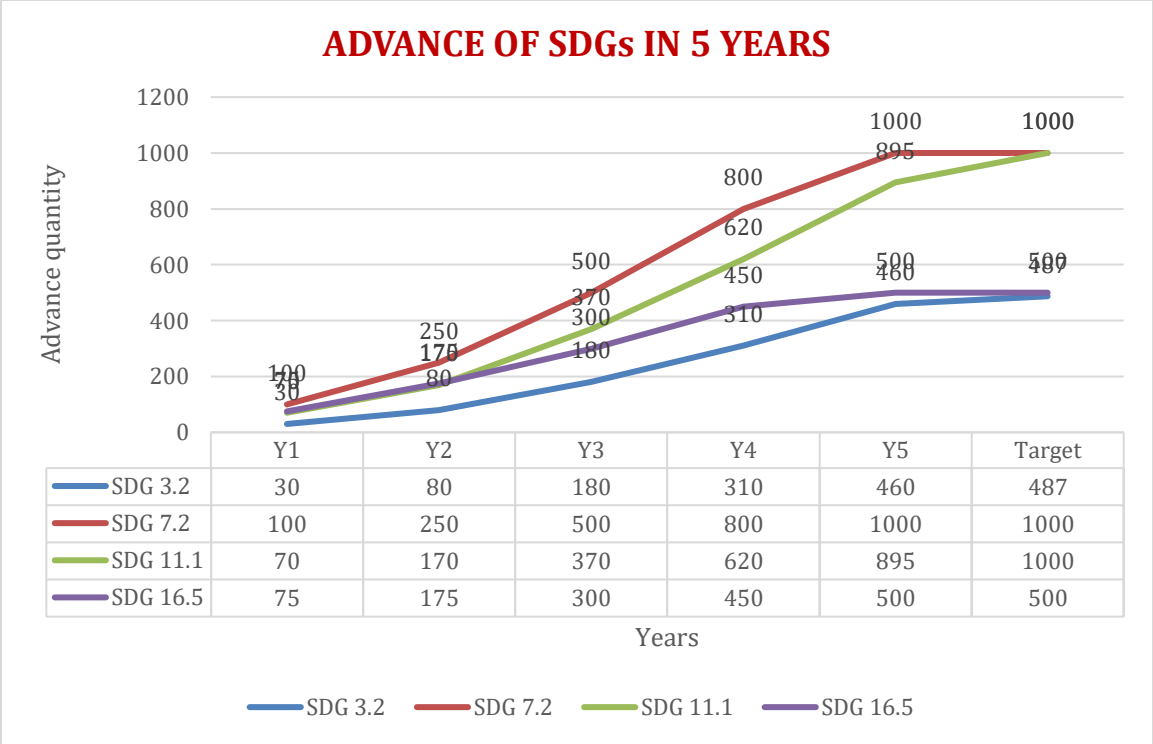
Figure 4 Project Executive Report
(second part)

Below in Figure 5 (part 1) are the monitoring curves for the intermediate results (outcomes) IR 1 to IR 3 and the lines of the advances of the indicators SDG 6.1 and SDG 4.1 in a simulation of one-year and the indicators SDG 3.2, SDG 7.2, SDG 11.1 and SDG 16.5 in yearly advances in a period of five years (Figure 5, part 2).



	Q1	Q2	Q3	Q4	Target
IR 1	200	450	400	800	850
IR 2	300	750	650	1000	1000
SDG 6.1	300	700	650	1350	1600
SDG 4.1	10	45	35	60	60
IR 3	300	680	580	720	723

Figure 5. Advance of IR and SDGs 6.1 and 4.1 Indicators (Part 1)



	Y1	Y2	Y3	Y4	Y5	Target
SDG 3.2	30	80	180	310	460	487
SDG 7.2	100	250	500	800	1000	1000
SDG 11.1	70	170	370	620	895	1000
SDG 16.5	75	175	300	450	500	500

Figure 5. Advance of SDGs 3.2, 7.2, 11.1 and 16.5 Indicators (Part 2)

The examples of the SDGs have been taken from exercises of the working groups of the last semester and inserted into the dynamic monitoring system of the course on Project Management to show the feasibility to include SDG information in project planning, monitoring and learning to motivate project managers to work with the information of the SDGs.

Finally, the executive report usually includes the last figures of the financial table like budget, disbursements and expenditures.

Inserting Local Resilience into the Dynamic Monitoring System

Just to mention the importance to employ local resilience indicators in dynamic monitoring systems to follow the principle of “Leave No One Behind” of the Agenda 2030. According to two national and regional projects implemented with UNICEF between 2008 and 2014 there were some important preparedness indicators that could be included in the system like:

- Community services with a simple plan for attention in emergency (PAE) with information of the vulnerable families and their needs in emergencies.
- Communities with evacuation plans (maps) and humanitarian resources.
- Schools with evacuation maps and simulation of an emergency every year in coordination with the community services and authorities.
- Municipal technical teams coordinating preparedness tasks with higher levels of government and with vulnerable communities.
- Municipal technical teams with a plan for a modular IDP camp according to international accepted standards and a budget for attention in emergency.

5. Conclusions

Responding to the importance to teach the SDGs at Universities, we showed the steps to be followed to make this possible and facilitate students the understanding of the importance of the SDGs, the use of the SDG information as Metric, Framework or Vocabulary in their professional lives as Coordinators, Observers or Participants.

First, we explained in the article the way how the students work together in groups of 3 to 5 members, building matrices with the information of indexes, targets and indicators of the SDGs, in which they are interested, then they calculate in three more matrices the amount of work to reach the goals until 2030, the annual work and the amount of work per affected population. This final information is useful for technical teams of local governments for planning the necessary work at a local, regional, or national level.

Then we showed the executive report with SDG indicators inserted into the dynamic monitoring system of a Project Management course, accompanying the monitoring of development outcome indicators (IR 1 to 3) towards their specific goals, to monitor if the project is contributing to the achievement of the sustainable goals as well. By doing the simulation we teach the students different ways of calculating the advances of the indicators toward the goals and to qualify those advances to compare between sectors or programs, or between outcomes for a better decision-making process.

The main contributions of the dynamic monitoring system in emergent and complex contexts like the one of the Agenda 2030 are:

- Monitoring of indicators beyond the short-term level of outputs of several methods, into the level of outcomes and impact of medium- and long-term results.
- Qualifying the advances of indicators toward goals, besides their numeric advances to facilitate the objective comparation between outcomes of different sectors or programs.
- Use of a non-linear systematization curve analysis that corresponds better with the reality.
- Use of a multi-program method that allows to fit better to development projects using the outcome mapping LF-Tree for coherence and consistency between targets, indicators, and metrics.
- Elaboration of simple executive dashboard reports that can be display on real-time.

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