



United Nations
Educational, Scientific and
Cultural Organization



UNESCO Chair
on e-Learning
Spain



Prof. Dr. Daniel Burgos
UNESCO Chair on eLearning

Alberto Corbí
Researcher at UNIR

Enhanced learner performance and interaction in MOOCs and OERs supported by a recommendation model on personalised learning

<http://research.unir.net>

research@unir.net

[@UNIRResearch](https://twitter.com/UNIRResearch)

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The LIME model is based on four vectors:

1. What every learner does based on his/her own contribution
(**L=Learning**)
2. What the learner does to support interaction-based learning and the relation with others, in addition to group interaction
(**I=Interaction**)
3. Wwhat teachers/experts value (**M=Mentoring**)
4. A transversal vector is applied to the three previous vectors, focused on evaluation (**E=Evaluation**)

So, **LIME** stands for **Learning, Interaction, Mentoring and Evaluation**

ID	Category	Setting	Input	Abs	Rel 100	Rel 40
L						
Learning						
			Input Learning Subtotal	100.00%	100.00%	40.00%
			Input Learning Informal	50.00%	50.00%	20.00%
			Input Learning Formal	50.00%	50.00%	20.00%
			Subtotal Learning	220.00%	100.00%	40.00%
			Subtotal Learning Informal	140.00%	50.00%	20.00%
			Subtotal Learning Formal	80.00%	50.00%	20.00%
L1	Learning	Informal	Post a message	10.00%	3.57%	1.43%
L2	Learning	Informal	Post a discussion topic	20.00%	7.14%	2.86%
L3	Learning	Informal	Meet a milestone	30.00%	10.71%	4.29%
L4	Learning	Informal	Upload a learning object	30.00%	10.71%	4.29%
L5	Learning	Informal	Enrich own learning object	40.00%	14.29%	5.71%
L6	Learning	Informal	Activity rate of recent contributions	10.00%	3.57%	1.43%
L7	Learning	Formal	EVAL: Self examination	20.00%	12.50%	5.00%
L8	Learning	Formal	EVAL: Continuous evaluation	40.00%	25.00%	10.00%
L9	Learning	Formal	EVAL: Self test	20.00%	12.50%	5.00%

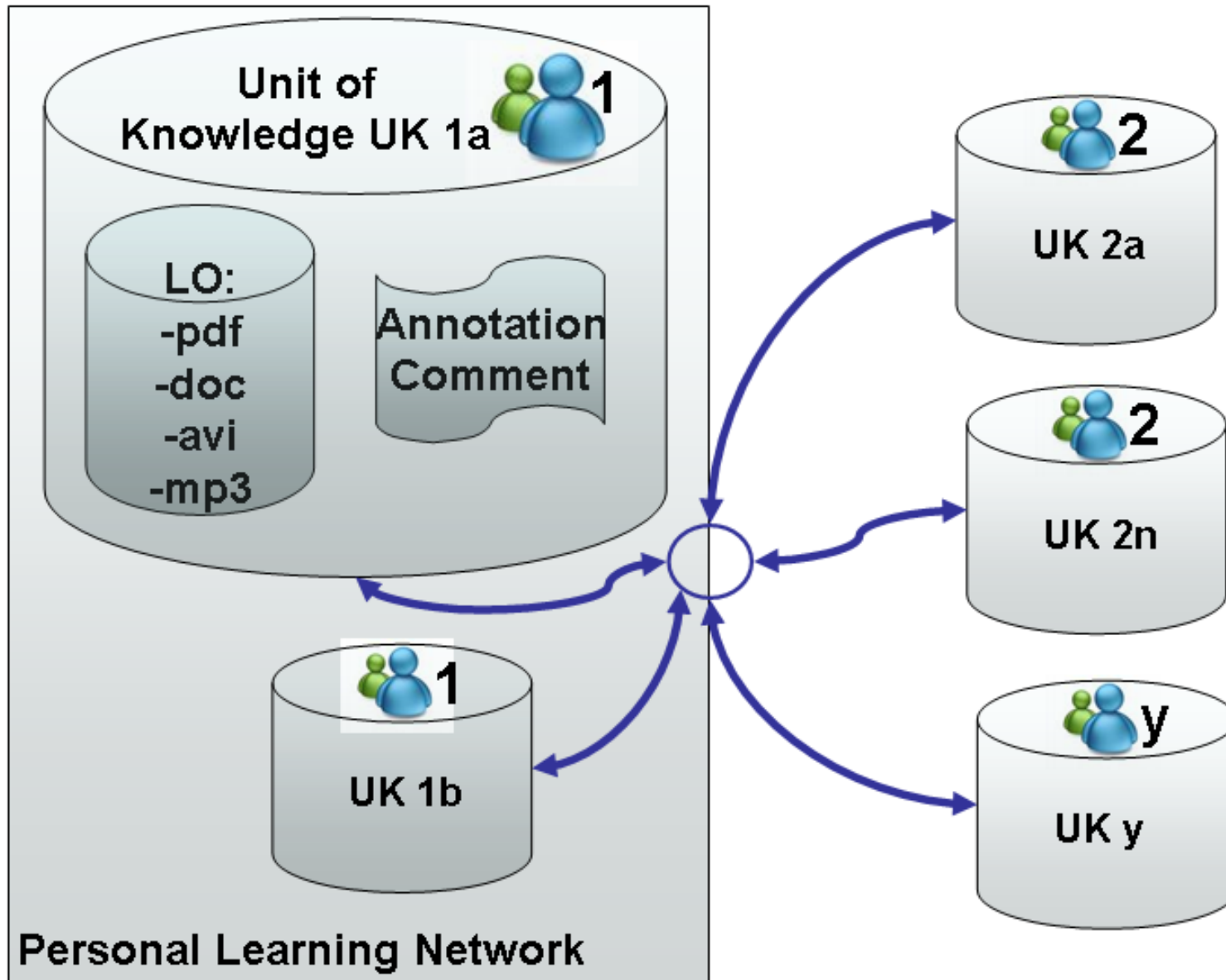
Cat-Setting	Weight	Check
Informal	50.00%	Ok
Formal	50.00%	
Learning	40.00%	Ok
Interaction	40.00%	
Mentoring	20.00%	

ID	Category	Setting	Input	Abs	Rel 100	Rel 40
I						
Interaction						
			Input Interaction Subtotal	100.00%	100.00%	40.00%
			Input Interaction Informal	50.00%	50.00%	20.00%
			Input Interaction Formal	50.00%	50.00%	20.00%
			Subtotal Interaction	230.00%	100.00%	40.00%
			Subtotal Interaction Informal	205.00%	50.00%	20.00%
			Subtotal Interaction Formal	25.00%	50.00%	20.00%
I1	Interaction	Informal	Complete the profile	35.00%	8.54%	3.41%
I2	Interaction	Informal	Select topics	25.00%	6.10%	2.44%
I3	Interaction	Informal	Reply a post	20.00%	4.88%	1.95%
I4	Interaction	Informal	Rate a post	15.00%	3.66%	1.46%
I5	Interaction	Informal	Reply a discussion topic	30.00%	7.32%	2.93%
I6	Interaction	Informal	Rate a discussion topic	15.00%	3.66%	1.46%
I7	Interaction	Informal	Discussion activity	35.00%	8.54%	3.41%
I8	Interaction	Informal	Enrich other's learning object	30.00%	7.32%	2.93%
I9	Interaction	Formal	Link from-to an external subject	5.00%	10.00%	4.00%
I10	Interaction	Formal	Collaborative work rate	20.00%	40.00%	16.00%

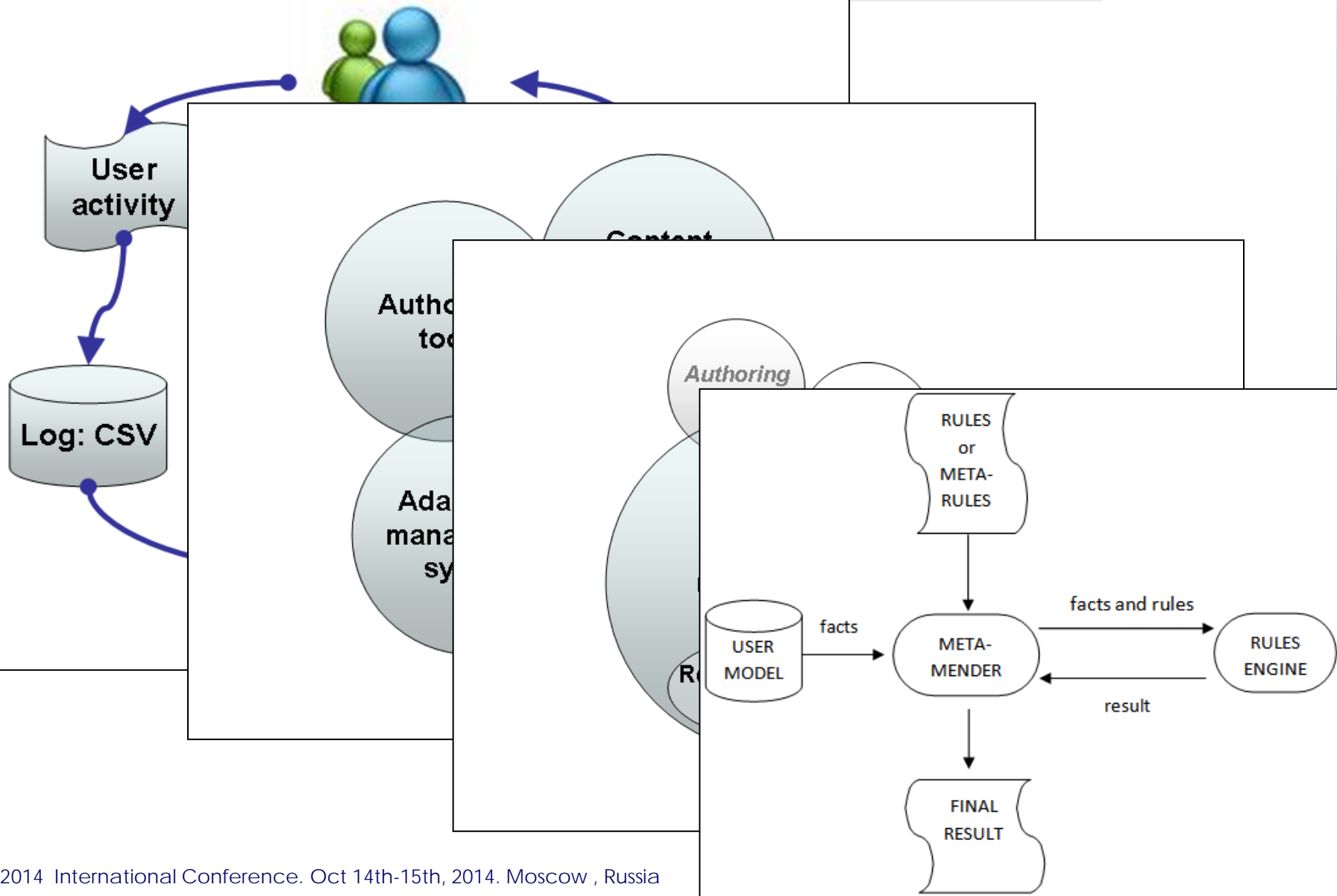
E		
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ID	Category	Setting	Input	Abs	Rel 100	Rel 20
M						
Mentoring						
			Input Mentoring Subtotal	100.00%	100.00%	20.00%
			Input Mentoring Informal	50.00%	50.00%	10.00%
			Input Mentoring Formal	50.00%	50.00%	10.00%
			Subtotal Mentoring	285.00%	100.00%	20.00%
			Subtotal Mentoring Informal	105.00%	50.00%	10.00%
			Subtotal Mentoring Formal	180.00%	50.00%	10.00%
M1	Mentoring	Informal	Trust rate from a peer	25.00%	11.90%	2.38%
M2	Mentoring	Informal	Trust rate from an expert	30.00%	14.29%	2.86%
M3	Mentoring	Informal	Reputation rate from a peer	20.00%	9.52%	1.90%
M4	Mentoring	Informal	Reputation rate from an expert	30.00%	14.29%	2.86%
M5	Mentoring	Formal	EVAL: Final assessment	60.00%	16.67%	3.33%

The model. Conceptual design

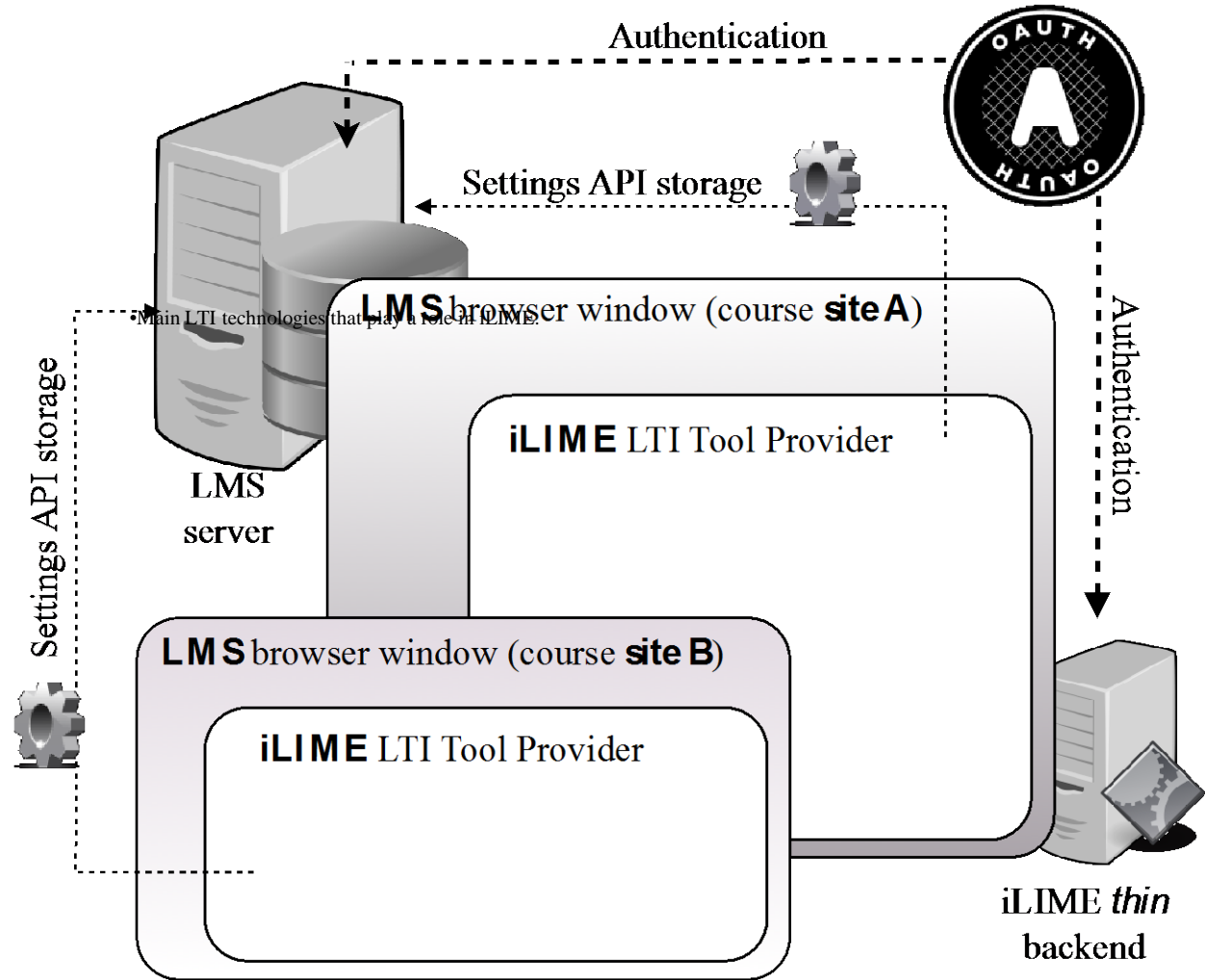


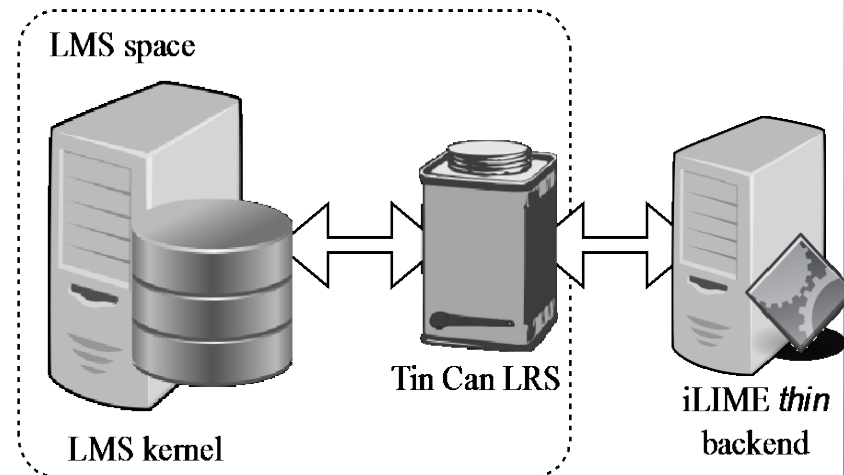
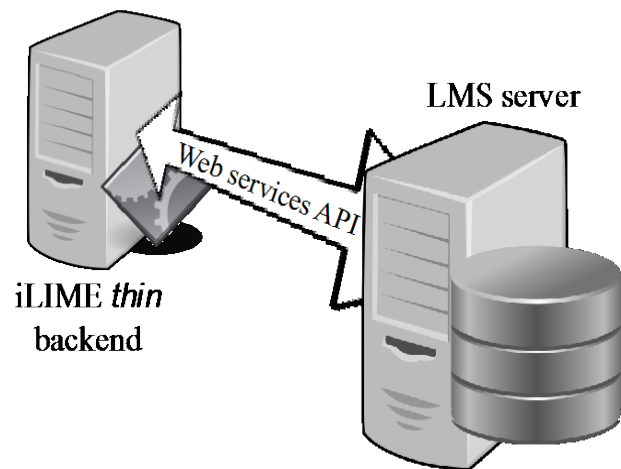
The model. Conceptual design, 2



IMS Learning Tool Interoperability (LTI) is an IMS Global Learning Consortium standard

A key benefit of IMS LTI is that it is a platform-independent protocol that allows the *plug-inization* of external tools and services into a site or course



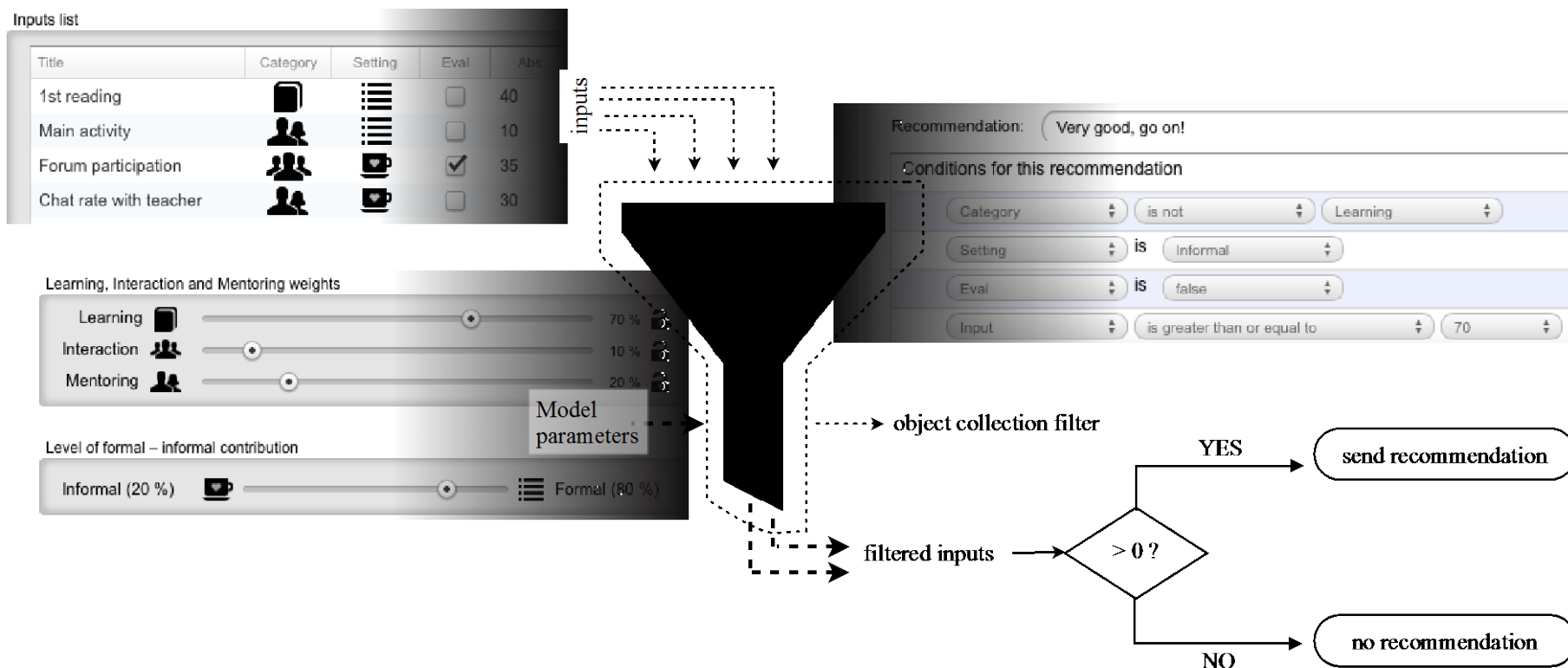


Inputs and student activity monitoring with LMS-dependent API calls (left)

and with Tin Can LRS API middleware (right)



The implementation. Process flow



iLIME administration console and rule application through modern object collection filtering

The application case. Virtual Campus

#LIME: Your performance in Informal Learning must improve

Recursos

Temas

Programación semanal

Documentación

TV Digital

Presenciales virtuales

Clases magistrales

UNIRTV

Comunicaciones

Última hora

Correo

Foros

Chat

Actividades

Semana	Estudio material básico	Trabajos (4 puntos)
1 02/07/12 – 06/07/12	Tema 1. Investigación, desarrollo e innovación 1.1. ¿Cómo estudiar este tema? 1.2. ¿Qué es la innovación? 1.3. Organismos de financiación españoles 1.4. Organismos de financiación europeos	Práctica: Internet of things for all (0,5 puntos)
	Tema 2. Diseño y gestación de proyectos de innovación 2.1. ¿Cómo estudiar este tema? 2.2. De la idea a la entrega del proyecto 2.3. La propuesta europea de innovación a nivel europeo 2.4. La negociación del contrato	Práctica: Template for business plan writing (0,5 puntos)

The application case. Definition of rules

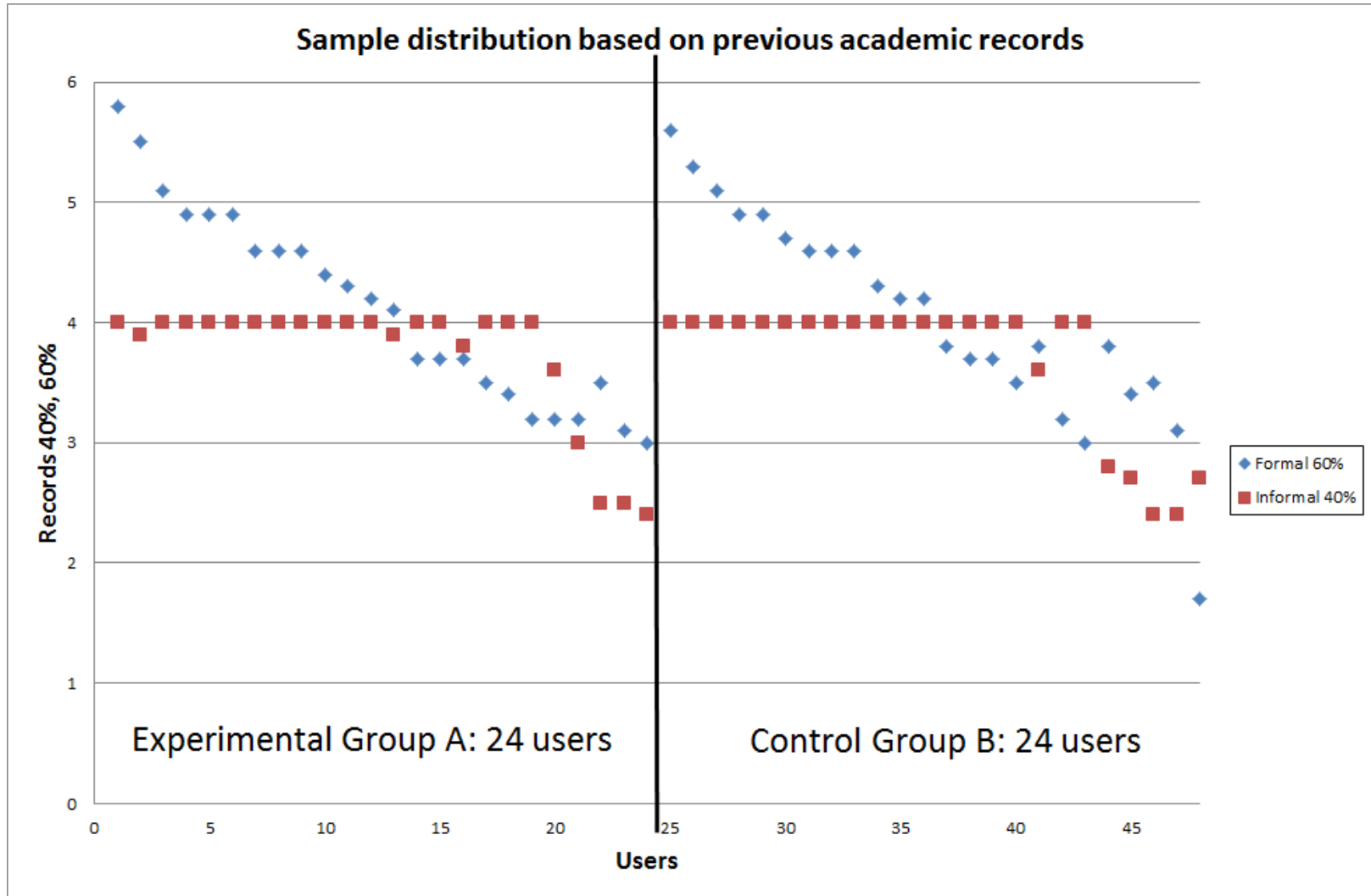
RuleID	Applied to	Rule Pseudo-code
R1	Input (e.g. L1 or M3)	IF any input is lower than maximum AND higher than or equal to $\frac{1}{2}$ maximum THEN positive feedback about this specific input



RuleID	Rule Coding	Recommendation provided, adapted to L1
R1	IF (L* OR I* OR M* < REL X) AND (L* OR I* OR M* >= 50%*REL X) THEN R1("Positive feedback to USER")	"Well done, when you post a message"

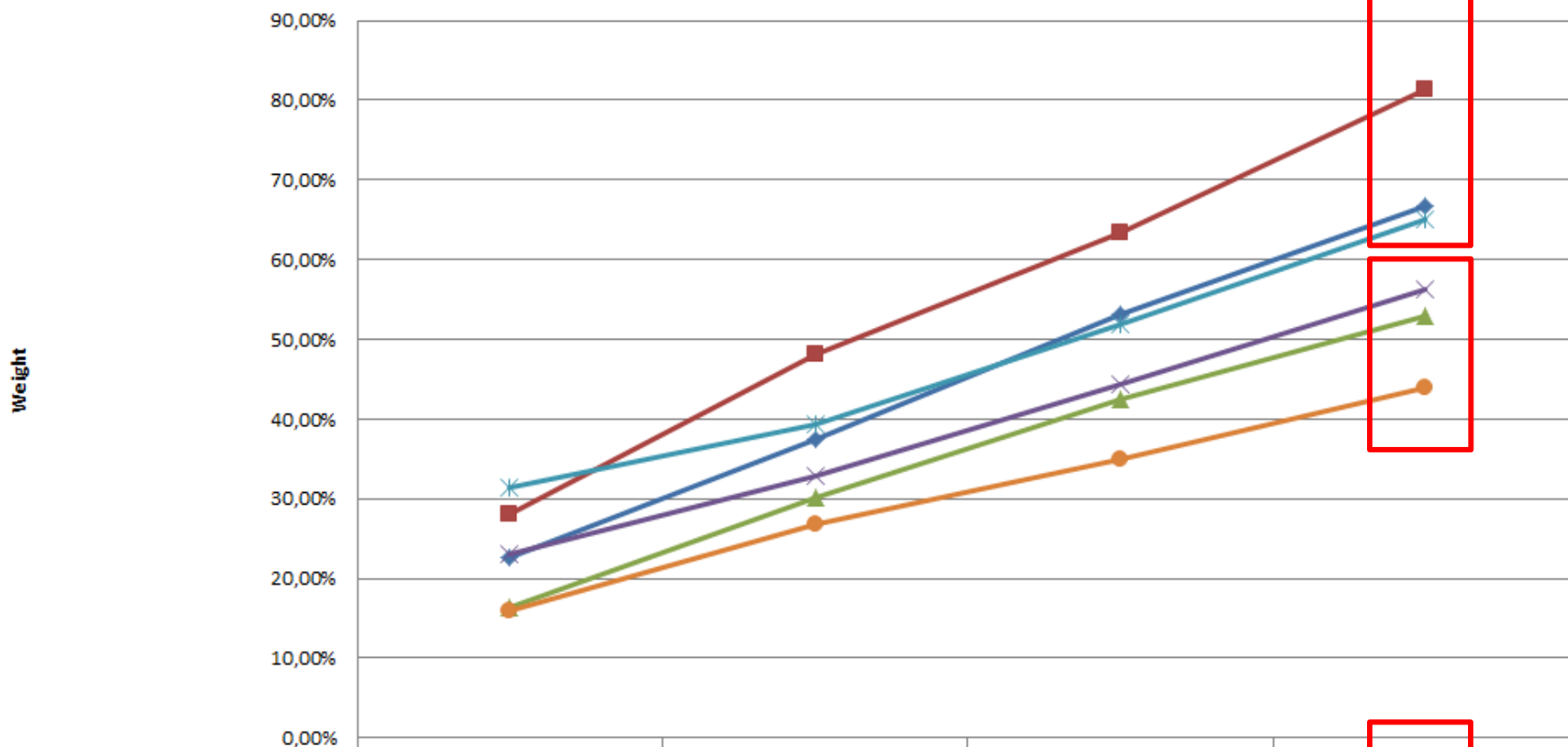


The application case. Sample



The application case. Results

Total. Experimental vs. Control



	M8	M15	M22	M29
◆ Average Group A: Experimental	22,61%	37,47%	53,09%	66,72%
■ Maximum Group A: Exp	28,15%	48,07%	63,36%	81,41%
▲ Minimum Group A: Exp	16,42%	30,12%	42,48%	52,88%
× Average Group B: Control	23,01%	32,83%	44,39%	56,19%
* Maximum Group B: Control	31,32%	39,28%	51,94%	65,06%
● Minimum Group B: Control	16,05%	26,88%	35,06%	44,04%

**Experimental
vs
Control
Learning**

**Experimental
vs
Control
Interaction**

**Experimental
vs
Control
Mentoring**

- Average Group A: Experimental
- ◆ Maximum Group A: Experimental
- ▲ Minimum Group A: Experimental
- × Average Group B: Control
- ✱ Maximum Group B: Control
- Minimum Group B: Control

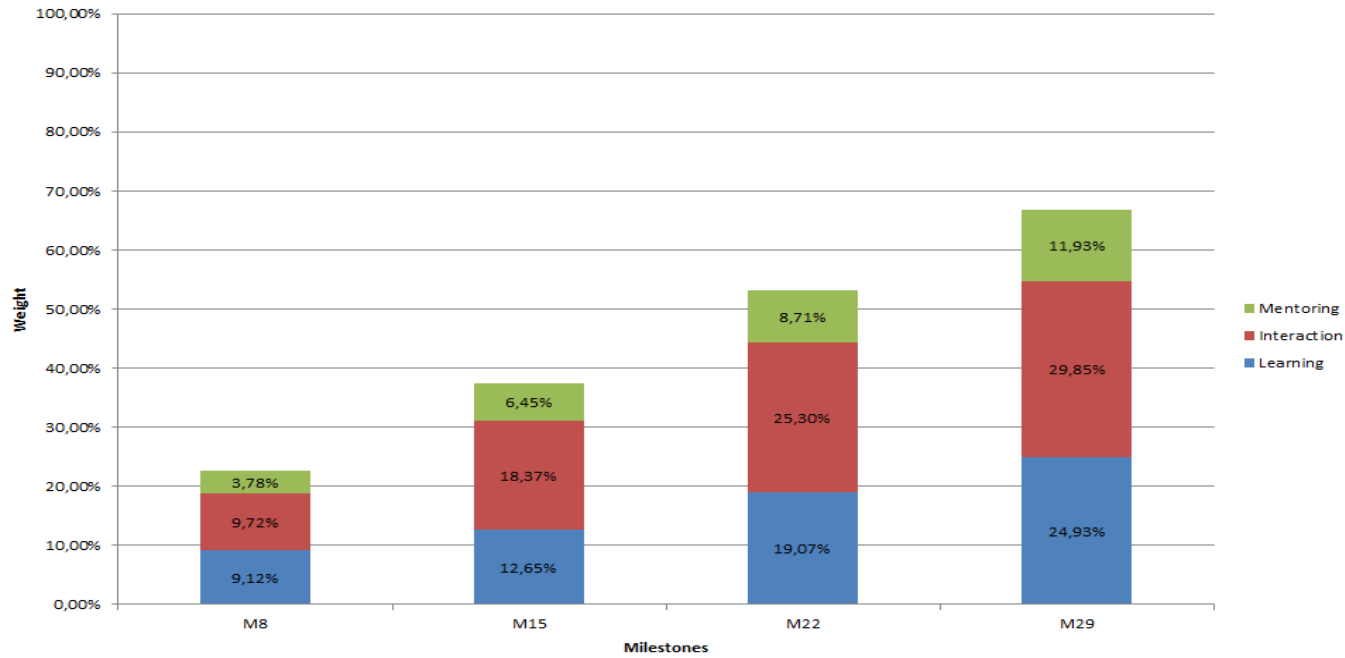
- Average Group A: Experimental
- ◆ Maximum Group A: Experimental
- ▲ Minimum Group A: Experimental
- × Average Group B: Control
- ✱ Maximum Group B: Control
- Minimum Group B: Control

- Average Group A: Experimental
- ◆ Maximum Group A: Experimental
- ▲ Minimum Group A: Experimental
- × Average Group B: Control
- ✱ Maximum Group B: Control
- Minimum Group B: Control

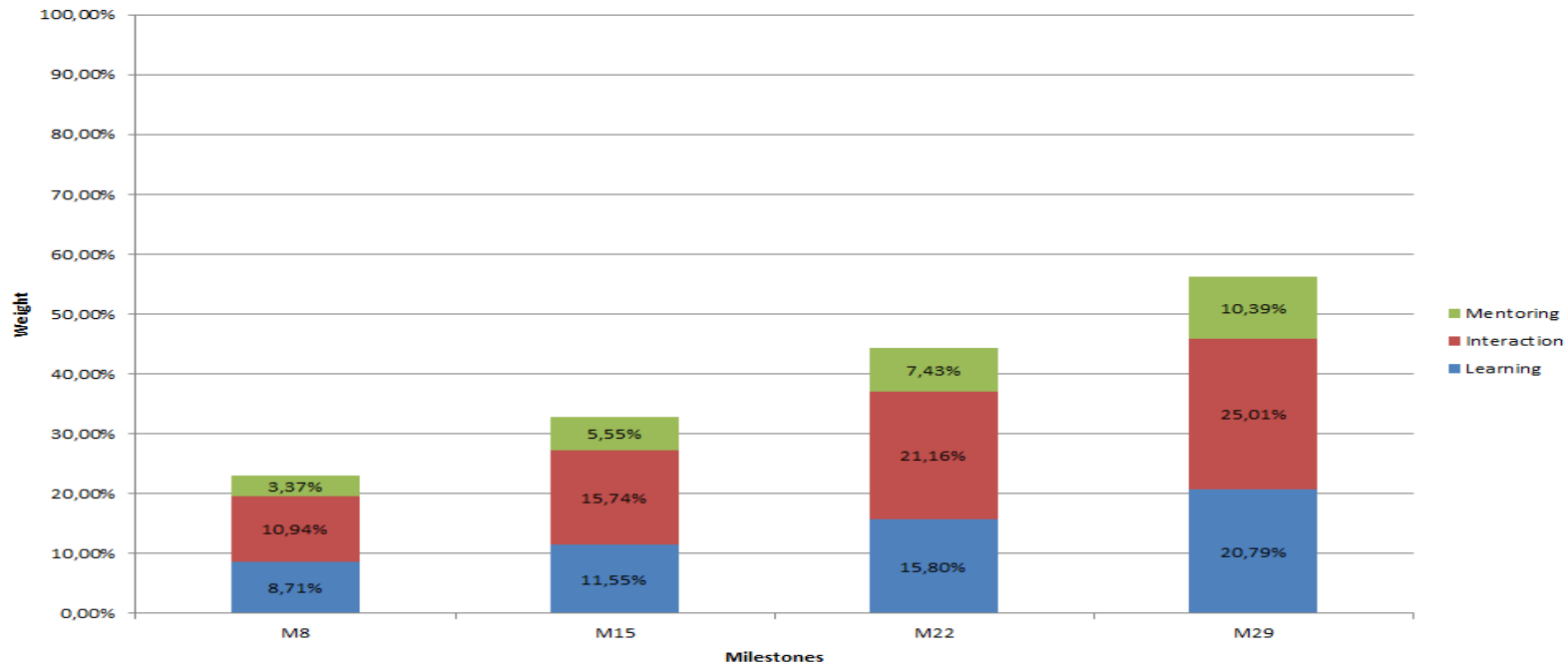
	M8	M15	M22	M29
■ Average Group A: Experimental	3,78%	6,45%	8,71%	11,93%
◆ Maximum Group A: Experimental	6,07%	8,41%	11,02%	15,22%
▲ Minimum Group A: Experimental	2,64%	4,94%	6,65%	8,33%
× Average Group B: Control	3,37%	5,55%	7,43%	10,39%
✱ Maximum Group B: Control	4,78%	6,96%	9,07%	13,34%
● Minimum Group B: Control	1,88%	3,46%	4,97%	6,80%

Milestones

Experimental Group. Total. Learning, Interaction, Mentoring



Control Group. Total. Learning, Interaction, Mentoring



Nr	Category	Question	Sum	Avg	SD	Max	%	Avg-Cat	%-Cat
1	Usefulness	Would you implement this recommendation model as a general service at this university?	69	3,29	1,52	105	65,71%		
2	Usefulness	The provided recommendation, was it useful?	82	3,90	1,00	105	78,10%	3,73	74,60%
3	Usefulness	Would you make use of this recommend. model in a different subject?	84	4,00	0,95	105	80,00%		
4	Usability	Did the recommendation focus your attention on the screen?	88	4,19	0,68	105	83,81%	4,14	82,86%
5	Usability	Did the recommendation support you in the learning process?	86	4,10	0,94	105	81,90%		
6	Performance	Do you think that the recommendation was valid to improve your performance?	85	4,05	1,02	105	80,95%	4,19	83,81%
7	Performance	Was the provided recommendation accurate and did it provide good counselling?	91	4,33	0,66	105	86,67%		
8	Content	The recommendation length, was it appropriate?	94	4,48	0,60	105	89,52%	4,36	87,14%
9	Content	The recommendation, was it properly written and easy to understand?	89	4,24	0,70	105	84,76%		
10	Adaptation	Do you think that the recommendation took all the related factors of your contribution to the subject?	69	3,29	1,27	105	65,71%		
11	Adaptation	Do you think that the recommendation has been adapted to your learning style?	80	3,81	1,33	105	76,19%	3,62	72,38%
12	Adaptation	Do you think that your results in the subject show the influence of the provided recommendation?	79	3,76	0,89	105	75,24%		
		SUM	996	3,95					
		Maximum	1.260	5,00					
		Agreement, in %	79,05%	79,05%					



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unesco-elearning.unir.net

www.vmpass.eu/the-project



www.emundus-project.eu

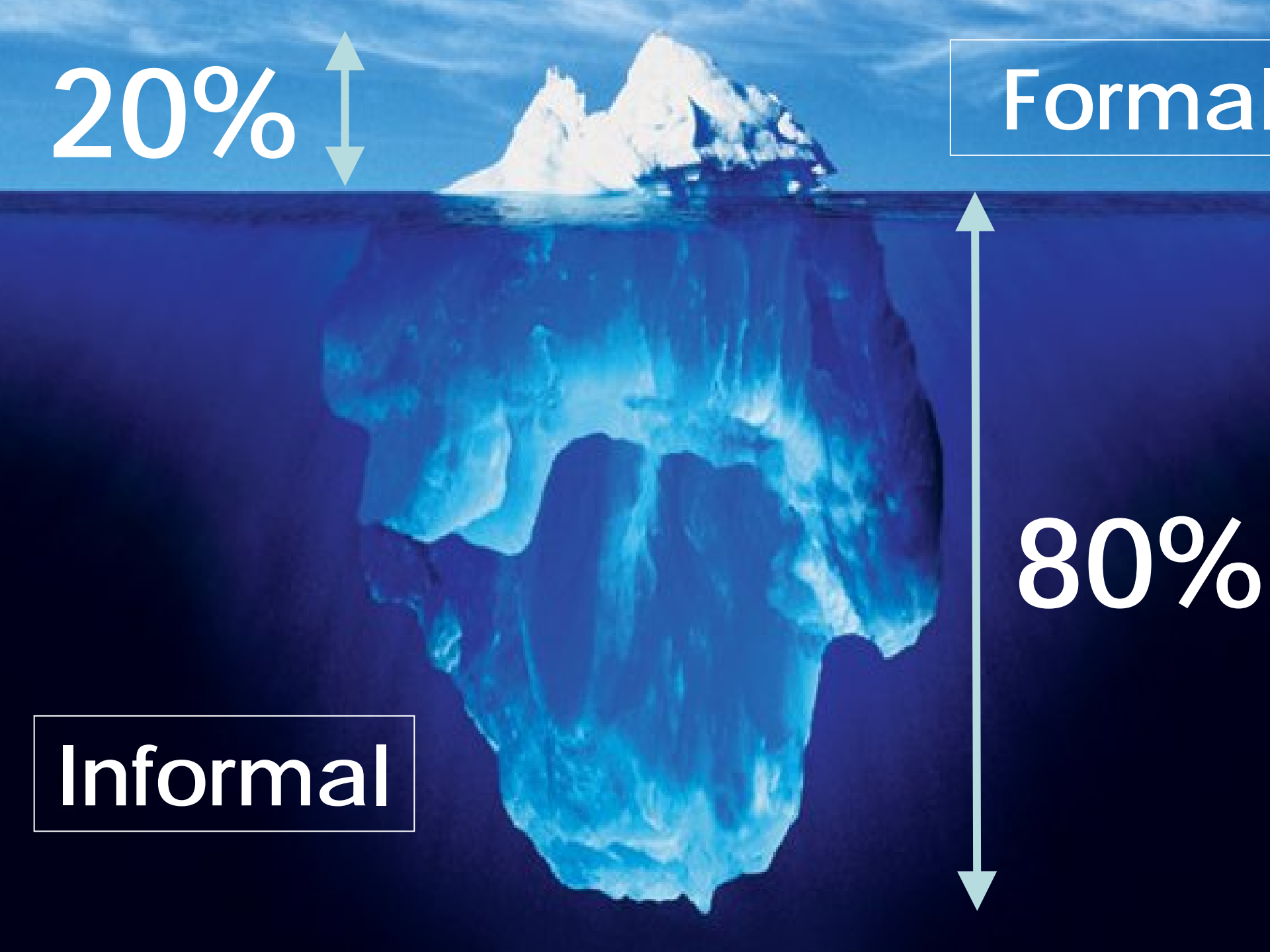
20%



Formal

80%

Informal





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• UNESCO Chair
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Prof. Dr. Daniel Burgos
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Thank you!

Спасібо!

Muchas gracias

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