



## THE SURVEY, A TOOL FOR THE ASSESSMENT

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### **Abstract**

It is presented the process for implementation and development of the survey like a tool for assessment in a course concrete architecture in the Xaverian Pontifical University. This work was developed for virtual learning of face to face students for the pandemic COVID. The author presents the philosophy of the method, the implementation for stages with students. The results are presented with examples of surveys that justify the conclusions. This methodology is possible employ in the teaching of applied sciences and require special abilities of the professor. The implementation requires competences in pedagogy, didactic and expertise practical of the professor in the specific knowledge domain of the course. The author recommends the implementation because foment the development of useful abilities for the next generation of professionals.

**Keywords:** 5E; surveys; assessment; virtual learning; BPL; reinforced concrete; structures; educational materials

### **Resumen**

*Se presenta el proceso desarrollado para la implementación del sondeo como herramienta de evaluación en el curso de arquitectura metálica en la Pontificia Universidad Javeriana. Implementado para la educación virtual de alumnos presenciales en la época de la pandemia de COVID. Se presenta la filosofía del método, las etapas implementadas con los estudiantes, los resultados y ejemplos de los sondeos practicados a los alumnos. Los cuales permitieron medir los resultados. Esta metodología se puede emplear en la enseñanza de ciencias aplicadas y su implementación requiere destrezas del profesor en pedagogía, didáctica y experiencia práctica de la materia que vaya a enseñar. La autora recomienda su implementación porque permite desarrollar destrezas que son muy útiles para los futuros profesionales.*

**Palabras clave:** 5E; sondeos; evaluación; educación virtual; ABP, concreto reforzado, estructuras; material educativo

## 1. Introduction

The asiganture concrete architecture is a matter of the first cycle of the undergraduate program of Architecture in the Xaverian Pontifical University. During six months the students learn the basic principles of the reinforced concrete applied to the buildings. In this case, due the pandemic of COVID 19, all the sessions were given the virtual form. Different resources were applied for the learning of the students. In this paper, the author presents her proposal of assessment, across de survey. The professor designed educational material applying the 5E Teaching Cycle of Engage, Explore, Explain, Elaborate and Evaluate. In this text is presented the completed development of this technique applied to the teaching of structures like is the reinforced concrete.

## 2. 5 E Teaching Cycle

For many years, my pedagogical proposal has been to apply the instructional design and the constructivist theory, beginning for the part for to arrive at whole, the Aristotelian philosophy. In Pardo, (2011), my research applied the Autonomous and self-regulate learning for the virtual education and combined the theory of Winne and Zimmerman. With the development of the technology other methodologies have been implemented and in my professional practice have applied with my students. Due the pandemic, all my face to face classes migrated at the virtually. For this reason, educational material was designed for the virtual classes, this material involves the theory of 5E Teaching Cycle. This theory has been supported for the National Science Teachers Association (NSTA). The method applies 5 key words for each stage. The first is ENGAGE, teacher and student try to solve a problem across the observation of phenomena, the intention is answer the questions what, where, when, how or why? In this stage, the professor helps to the student with the generation of questions for to solve the problem and evaluate if the student understands the problem. The second E, is EXPLORE, in this stage, the student explores, the phenomena, and decides upon your interests of exploration. He elaborates hypothesis and try the solve the questions that he proposes himself, the teacher tries to detect the misconceptions and explains, so the student rewrite your hypothesis if he considers it. Later he proposes his answers in front the phenomena. In the third stage, EXPLAIN, the student with data collection about the phenomena, proposes your calculations, and get better your argumentation for solve the proposed problem, in this moment, the teacher explains the fundamental importance that for the scientific method implies the adequacy interpretation of data. The fourth stage, ELABORATE, in this part the student unions all the material of the three previous stages, writes its inform and he arguments about all the collected data and analyses the different hypothesis and explain your solution to the proposed problem. The last stage is EVALUATE, where professor and student analyze the product of all their work and decide if it is enough the realized product and recommend future problems to solve. At finally, the method pretends to promote the exploration for resolution de scientific problems and it is useful for the applied science like architecture and engineering.



### 3. The methodology

In ENGAGE, the students read theory of cement, concrete, aggregates. Simultaneous, they read about the Colombian seismic standards for reinforced concrete design (NSR-10- Norma Sismo Resistente -2010), and receive theoretical classes for the professor. Later the students received instructions for the elaboration for a little slab in mortar (water, sand cement and limestone), this is the EXPLORE. The students must do the formwork, tie up the rebar, buy all the materials, mix and elaborate the mortar and do a video, with all the process. They must cure the slabs at home, first submerged the slabs in water and later in a wet environment during 28 days.

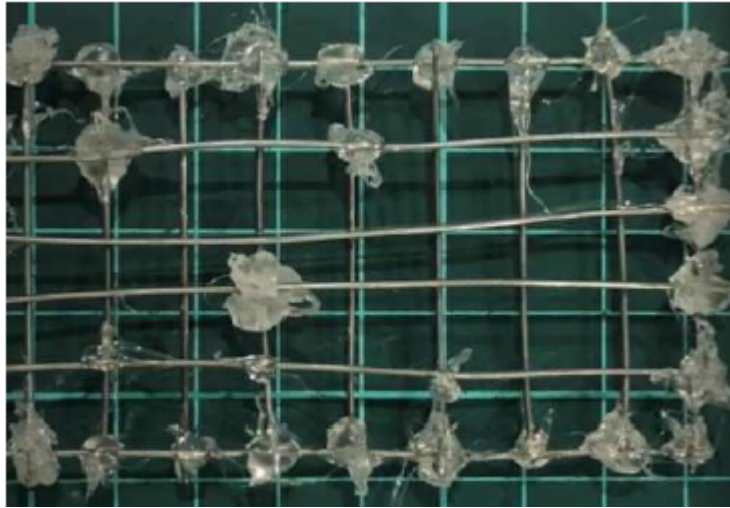


photo 1. Rebar. (Student: Julián Beltrán, Nov 2020)



Photo 2. Formwork. (Student: Julián Beltrán, Nov 2020)



Photo 3. After Cured. (Student: Julián Beltrán, Nov 2020)

In EXPLAIN, the students receive instructions about data analysis and possible causes for aspect, color, strength, form, texture and they must extrapolate for your case themselves their explanations. Additionally, the students receive instructions about the failure of each slab and they must do a new video about the fault and conclude.

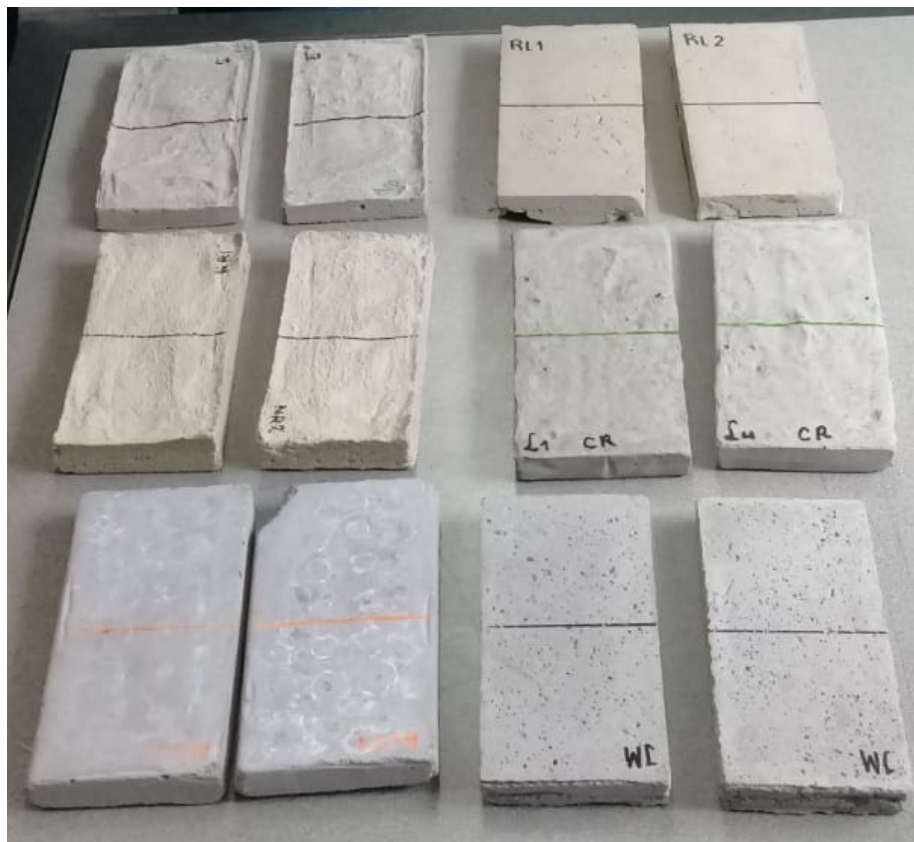


Photo 4. Aspects. (educational material of Zulma S. Pardo V., April 2018)





Grupo	Muestra	b (mm)	h (mm)	L (mm)	Tipo de arena	Arena	Agua	Cal	Cemento	Marca cemento	Aceite
1	6B3	72	14.5	139	Río	4	0.75	1	1	Argos	Gourmet
1	6B4	71	15	145	Río	4	0.75	1	1	Argos	Gourmet
2	PC5	76	15	151	Peña	3	1	1	1	No se	Gourmet
2	PC6	75	15	150	Peña	3	1	1	1	No se	Gourmet
3	P1	70	20	133	No se	4	1	1 kg	1	Blanco	Girasol
4	PD1	70	15	141	Río	4	0.75	1	1	Argos	Gourmet
4	PD1	70	15	141	Río	4	0.75	1	1	Argos	Gourmet
5	P3A	69	15	119	Peña	3	1	1	1	Blanco	Gourmet
5	P4A	70	15	131	Peña	3	1	1	1	Blanco	Gourmet
6	PE1	70	15	130	Peña	3	0.5	1	1	No se	Gourmet
6	PE2	70	15	130	Peña	3	0.5	1	1	No se	Gourmet

Photo 5. Data Analysis. (educational material of Zulma S. Pardo V., April 2019)



Photo 6. Failure without rebar. (Student: Aranza Valentina Barragán, Nov 2020)



Photo 7. Failure with rebar. (Student: Aranza Valentina Barragán, Nov 2020)

In ELABORATE, the professor explains calculations of minimum seismic requirements for slabs and more data analysis of strength. The students prepare your final inform with the conclusions of the all practice. They must elaborate an inform like if they were the builders of the slab with your own



specimens and another inform like they were the technical supervisor of other student. At final, they must compare the two works and conclude.

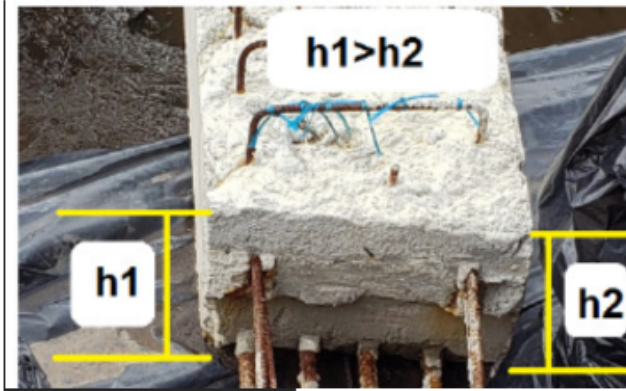
#### 4. Evaluate and the survey like a tool of assessment

Finally, the informs are evaluated, the professor analyses each work and each student receives your feedback. In this moment, near to the end of this course, the student must be able evaluate simple cases of reinforced concrete structures applying the visual method. Across de platform blackboard the professor proposes others problems and apply a short survey, where student and teacher can identify the level of learning. The survey has not qualification, when de student answers, the professor gives the right answer and the student at home qualifies your answers himself. In the last survey the students inform the right answers obtained and express your impressions about all process. At this way the course finishes.



Photo 8. Survey. (Zulma S. Pardo V., May 2021)





qué opina de la formaleta? ■

Sin respuesta	4
1 de excelente calidad	0
2 el que la hizo no sabia de formaletas	3
3 le faltó asegurar bien la formaleta	0
4 la fabricaron mal	2
5 no saben fundir concreto	6

Ocultar respuestas [Borrar](#)

Photo 9. Survey. (Zulma S. Pardo V., May 2021)

después de ver la asignatura en concreto, puedo afirmar que ■

Sin respuesta	2
1 el concreto es muy bueno para tensión	1
2 el acero es muy malo a compresión	1
3 los edificios se pueden hacer con concreto simple	1
4 nada de lo anterior.	7
5 1,2 son correctas	1

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después de ver la asignatura en concreto, puedo afirmar que ■

Sin respuesta	2
1 más arena en el mortero produce más resistencia	1
2 menos cemento en el mortero produce más resistencia	0
3 más piedra en un concreto produce más resistencia	0
4 más agua produce más resistencia en un mortero	2
5 menos relación a/mc produce más resistencia en un mortero	8

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Foto 10. Survey. (Zulma S. Pardo V., May 2021)



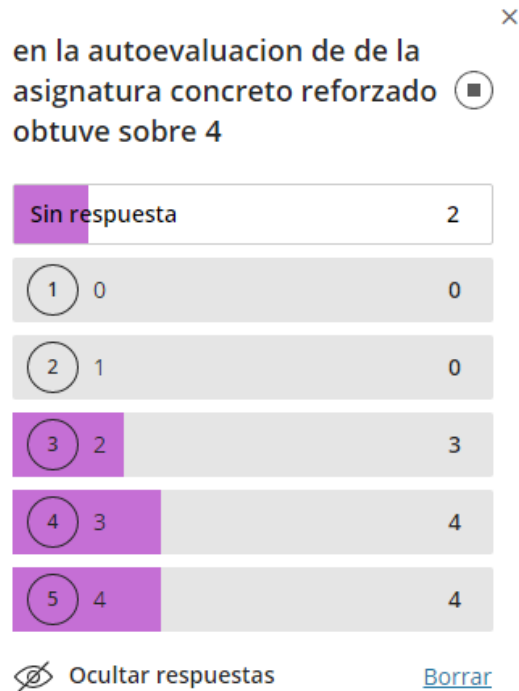


Photo 11. Survey. (Zulma S. Pardo V., May 2021)

## 5. Conclusions

The 5E Teaching Cycle is a good method for design educational materials for virtual and face to face learning sessions. This method implies design materials for different levels for each "E" or stage of learning. The exercises in undergraduate program in the matter reinforced concrete involves minimum five weeks working students and professor. The survey without qualification in the end of course is a good tool for measure results of all learning process. The written work in the stage ELABORATE, is very important to determine the level of learning and requires feedback student for student.

The survey with applied cases is necessary to contrast the learning. The comparison between students is important because they can learn different colors, aspects, textures and they can evaluate themselves.

Apply this method implies expertise of the professor in teaching and de construction practice. Better cases will be proposing with more expertise of professor.

The next professionals require develop practical abilities that facility the take of decisions the 5E Teaching Cycle with surveys offer a good tool for the teaching of the Architecture and the Engineering.

The author has employed this technique in forensic engineering courses virtual and face to face and without doubt is a method with very potential.





## 6. References

### Books

- AIS (2010). Norma Sismo Resistente Colombiana. Asociación Colombiana de Ingeniería Sísmica (AIS), Bogotá, D.C. Título C y D.
- Banko, W. et Al. (2013). Science for the Next Generation; Preparing for the New Standards. NSTA Press. Arlington, USA.
- Pardo, Z. (2011). Desarrollo de un AVA para la enseñanza de diseño de conexiones simples en estructuras metálicas. Tesis de especialización en TIC aplicadas a la educación. Universidad Pedagógica Nacional de Colombia., Bogotá, D.C.

### Electronic resources

- Universidad Nacional de Colombia. (2020, octubre). El futuro de las profesiones al 2034. Consultado el 10 de junio de 2021 en <https://youtu.be/cz43iTn2mdQ>
- Julián Beltrán. (2020). Video fabricación losetas Semestre II/2020. Consultado el 11 de junio de 2021 en <https://youtu.be/85HQgRFuUeY>
- Julián Beltrán. (2020). Video rotura losetas Semestre II/2020. Consultado el 17 de junio de 2021 en <https://youtu.be/6NFUR3qFWV0>
- Aranza Valentina Barragán. (2020). Video rotura losetas Semestre II/2020. Consultado el 11 de junio de 2021 en <https://www.youtube.com/watch?v=h22yxrEJN-k>

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