Rojas-López, A., & García-Peñalvo, F. J. (2017). *4 elements proposed to offer personalized education.* Paper presented at the 3rd International Conference on Education - ICOED 2017, 7-9 November, Melaka, Malasia. doi:10.5281/zenodo.1194348

4 elements proposed to offer personalized education

Arturo Rojas-López[1], Francisco José García-Peñalvo[2]

[1]Universidad Tecnológica de Puebla, Antiguo camino a la resurrección 1002-A, México
[2]Universidad de Salamanca, Facultad de Ciencias – Plaza de los Caidos s/n, España

arturo.rojas@utpuebla.edu.mx, fgarcia@usal.es

The personalized education represents a further advance in recognition of the individual within educational context; several are actions that can be performed in classroom to recognize the uniqueness and autonomy of learning of each student. In higher education, and particularly for the system of technological universities in Mexico, 4 elements were proposed which, without going against current trend of educational model, may favor personalized learning. The contents, work modes, rhythms and timing, and evaluation options were worked during course methodology programming of quarter September - December 2016 in two control groups. The paper describes the four elements proposed in higher education which is a novelty; the number of accredited students, average grade of groups and using a qualitative methodology of surveys are presented positive results obtained from proposal with control and experimental groups, as well as the opportunities that can improve the offer of personalized education for following quarter.

Keywords: Personalized education, High education, Science computation.

1. INTRODUCTION

"*Personalized education is a concept open to different currents, systems, methods, techniques, procedures and investigations, insofar as they contribute to formation of the whole person*"[1] and university environment is not exempt. The new Educational Model for Obligatory Education. Educating for Freedom and Creativity[2] in Mexico, it proposes elements of adaptation and flexibility that they can be considered within personalized education; of the five main axes that it raises, the following notes are taken:

I. The curricular approach. *A humanist approach, grants to schools a margin curricular autonomy, which could adapt educational content to specific needs and contexts of students.*

II. The school at center of educational system. *The school should focus on achieving* the *maximum learning of all its students.*

III. Teacher training and professional development. The teacher *generates inclusive learning environments, and is able to adapt curriculum to its specific context*.

IV. Inclusion and equity. *The education system is for all students and must provide the basis for everyone to have opportunities, recognizing their social and cultural context.*

V. Governance of the educational system. *It recognizes the plurality of actors involved in educational process.*

In work carried out by Sadovaya[3] on personalized education strategies in higher education, highlights a student-centered approach, to get active people, and responsible acting in ambiguous situations. Hart[4] also considers student with an important value in its education initiative accuracy as *the adaptation of education to specific characteristics of each student.* Tekin[5] comments three challenges for customizing education *(i) students should receive education and customized training according to their contexts (e.g., already taken classes, preferred learning methods, etc.), (ii) For each specific context, the best method of teaching and training (e.g., the type and order of teaching materials to be taught); iii) education and training must adapt online, based on the ratings / comments (e.g., exams, final exams, likes / dislikes, etc.) of students;* his work proposes a personalized online system, highlighting among other things what sequence of didactic material to present to a student. Laksitowening´s work[6] considers the importance of individual and fulfillment of a certain

level of competence, proposing a custom architecture of e-learning in Indonesia, the system consists of 5 components: *learning structure integrated, learning model, scenario personalized learning, selection of personalized content and based on portfolio assessment.* Another view that considers personalization is work of Serral[7], creating an atmosphere of intelligent and adaptive learning to provide personalized feedback on higher education; and work of Zhang[8] directed to university education to *support the recommendation of customized courses based on learning situation.* Reigeluth[9] writes of an Integrated Education System Custom (FEET) with 4 main functions for student learning: recordkeeping, planning, instruction, and assessment for and of student learning.

The proposal presented was supported by use of Moodle platform that allowed organizing contents, so that students could choose learning tools. Other important element was evaluation of computational thinking[10, 11] that offered an orientation based on students' abilities and offer a learning environment face-to-face, blended or online[12, 13]. The novelty of experiment was to work for higher education the concept of personalized education, proposal took as a reference the five points proposed by new educational model in Mexico and previous experiences of publications, thus were offered in a new way topics of course using Moodle platform, worked on three learning scenarios, with a pace determined by student and offered assessment options.

This article is organized as follows: in section 2, elements proposed to implement personalization in the course of programming methodology, in section 3, results obtained and finally conclusions of work done.

2. 4 ELEMENTS FOR PERSONALIZED EDUCATION

1. Content

The organization of contents in platform was determined by 3 stages, in heading of course the objective, framing of subject and because it is initial course of programming, concept of Information Technologies was indicated. At each stage, target was also included, and readings, audios, videos, activities, forums and evaluation evidence were organized through folders. The number of units as well as topics by subject sheet indicated by General Coordination of Technological Universities was respected. The intention was that when student knew objective, could develop different product options that give evidence of their abilities, and thus move on to next stage. The pattern in this sense is directed towards offer of giving more possibilities of doing in counterpart to that all the students dominate the same contents and get consequently the same level of objectives.

2. Work modes

The classroom as a learning center is not the only means, much less the only space to evidence skills, as each student could choose whether to read or listen to theory or watching videos, showed flexibility in strategies to use in work groups, main idea was to orient learning emphasizing the unique and own way of learning of each student.

3. Rhythms and timing

The objective of course and of each stage was same for all students but each determined their learning rhythm, it was an opportunity for student to choose what and at what rhythm to learn.

4. Evaluation options

Exercises or assessment activities were offered that the student chose. It was able to perform programs, flowcharts or pseudo code, and according to working group the review was face-to-face or online. There was a deadline, but students in agreement with teacher indicated day they reported delivery of assessment exercises to be graded.

3. RESULTS

The intervention of 4 elements proposed was carried out in two experimental groups (1° C and 1° D)

where subject was taught during September - December 2016 quarter, number of students was 65. Five control groups served to compare results obtained from proposal. Teachers of 1° A, 1° B, 1° E, 1° F and 1° G gave their classes in a traditional way and without using Moodle platform. The results that were considered were: percentage of students approved, average grade of group and number of students approved in ordinary period (Autonomous-10-AU, Outstanding-9-DE, Satisfactory-8-SA, NA-not approved) and extraordinary-EX.

Two months after starting semester, only 24 students answered a voluntary questionnaire survey to know evaluation of proposal; results to questions asked are in Table 1. 75% of students agreed with their way of learning. 83.3% of students knew how to use platform and mainly used activities created. At the end of course, another voluntary survey was applied and just 15 students responded. Table 2 contains questions and results obtained. 86.7% of students accepted the learning mode as a space to acquire competences of course and learned concepts of programming.

Table 3 shows concentration of results from control and experimental groups at the end of course. The percentage of accredited students and average grade per group were similar to control groups, except drastically in comparison with 1° E and 1° F; difference between the control and experimental groups was number of approved in an extraordinary period by the teacher of each group, something that did not happen with 1° G where career director proposed post-course activities for students to approve. In experimental groups was double number of students who accredited in extraordinary compared to control groups, above may be due to face-to-face work with students in classroom compared to the proposal of an educational strategy that sought autonomous learning. This can be reinforced by comparing number of accredited students with autonomous qualifications of 1° A and 1° B.

Table 1. Questions and results of first survey

Question	Results
About work mode, do you think is adequately with your learning expectation?	75% Yes 25% No
Do you know the objectives that you have to reach or do you have clear knowledge and what you should know to do at the end of course?	66.7% Yes 33.3% No
Do you feel lost using platform; you do not know what to do and what for?	83.3% No 16.7% Yes
Of resources contained in platform **Which one did you use?**	You could choose more than one option Activities 20 students Reading 17 students Video 13 students Audio 11 students
What action do you suggest to improve learning or do you agree with your learning environment?	Open question, written comments had two aspects: • To agree 16 students • Disagree and want to face class 8 students Suggest more hours of

practice 5 students

4. CONCLUSIONS

Student participation in first survey was unfortunately low, only 24 out of 65. Surprised that among the comments made suggest "normal classroom or laboratory classes", as well as fact that 41 students did not want to express their opinion, there was no 100% empathy with the proposed learning environment, but on the other hand 7 students scored Autonomous which means that adapting to a different form of learning represents a problem for most, one student wrote comment: "My suggestion is that classes were given to everyone equally." At the end of course 1 student indicated "I would like that subject not to be separated for some students", 3 students did not write any comments and 3 reemphasized their preference of learning in person. The use of Moodle platform and elaborated organization was favorable for its intervention in quarter and with students, who studied the subject, 53 students accredited course, 12 desertions were reported. Assuming that 4 elements are correct, but previous circumstances of students in high school do not provide autonomy of learning, to increase number of students who obtain better results with personalized education proposal, following activities can be worked during the propaedeutic period or in first week of classes: use of Moodle platform, exercise of computational thinking skills, elaboration of evaluation reagents by students and use of gamification.

Table 2. Final survey

Question	Results
Was learning modality adequate to acquire competences of the course?	86.7% Yes 13.3% No
Was evaluation of your skills at beginning of quarter a successful activity to determine the best learning environment?	73.3% Yes 26.7% No
Select concepts you are familiar with	Number of students
Type of data	11
Arithmetic operators	9
Creation of identifiers for variables	10
Logical operators	11
Relational Operators	11
Operator hierarchy	10
Solve arithmetic, logical and relational expressions	11
Using a counter and accumulator variable	10
Selection structure	4
Repetition structure	11
Definition and creation of an algorithm	10

Table 3. Results of all groups

	Control groups				Experimental		
	A	B	E	F	G	C	D
Total	34	33	33	33	32	32	33
AU	6	5	2	1	6	5	2
DE	5	4	1	1	1	3	3
SA	10	8	0	3	0	2	1
EX	5	8	9	8	19	18	19
NA	8	8	21	20	6	4	8
%	76.5	75.8	36.4	39.4	81.2	87.5	75.8
Grade	6.6	6.4	3.0	3.2	6.9	7.4	6.2

ACKNOWLEDGMENTS

This research work is made within University of Salamanca PhD Programme on Education in the Knowledge Society[14, 15] scope.

REFERENCES

[1] J. Bernardo, J.J. Javaloyes, J.F. Calderero. Educación personalizada: principios, técnicas y recursos. 2011. Madríd: Síntesis.
[2] Secretaría de Educación Pública. Ruta para la implementación del modelo educativo. 2017. SEP-México. pp. 14-16.
[3] V. V. Sadovaya, O.V. Korshunova, Z.Z. Nauruzbay. Personalized education strategies. Mathematics Education, 11 (1), (2016), pp. 199-209. DOI: 10.12973/iser.2016.21019a
[4] S.A. Hart. Precision Education Initiative: Moving Toward Personalized Education. Mind, Brain, and Education, 10 (4), (2016) pp. 209-211. DOI: 10.1111/mbe.12109.
[5] C. Tekin, J. Braun, M. Van Der Schaar. eTutor: Online learning for personalized education. ICASSP, IEEE International Conference on Acoustics, Speech and Signal Processing - Proceedings, 2015-August, art. no. 7179032, pp. 5545-5549. DOI: 10.1109/ICASSP.2015.7179032.
[6] K.A. Laksitowening, Z.A. Hasibuan. Personalized e-learning architecture in standard-based education. Proceedings - 2015 International Conference on Science in Information Technology: Big Data Spectrum for Future Information Economy, ICSITech 2015, art. no. 7407787, pp. 110-114. DOI: 10.1109/ICSITech.2015.7407787.
[7] E. Serral, J. De Weerdt, G. Sedrakyan, M. Snoeck. Automating immediate and personalized feedback taking conceptual modelling education to a next level. Proceedings - International Conference on Research Challenges in Information Science, 2016-August, art. no. 7549293. DOI: 10.1109/RCIS.2016.7549293.
[8] J. Zhang. Research on e-learning in college education: A model on personalized resource recommendation based on learning situation. Proceedings - 2015 IEEE 12th International Conference on Ubiquitous Intelligence and Computing, UIC-ATC-ScalCom-CBDCom-IoP 2015, art. no. 7518408, pp. 1264-1268. DOI: 10.1109/UIC-ATC-ScalCom-CBDCom-IoP.2015.229.
[9] C.M. Reigeluth, S. Aslan, Z. Chen, P. Dutta, Y. Huh, D. Lee, C. Lin, Y.-H Lu, M. Min, V. Tan, S.L. Watson, W.R. Watson. Personalized integrated educational system: Technology functions for the learner-centered paradigm of education. Journal of Educational Computing Research, 53 (3), (2015) pp. 459-496. DOI: 10.1177/0735633115603998.
[10] F. J. García-Peñalvo, "A brief introduction to TACCLE 3 – Coding European Project," in 2016 International Symposium on Computers in Education (SIIE 16), F. J. García-Peñalvo and J. A. Mendes, Eds. USA: IEEE, 2016. doi:10.1109/SIIE.2016.7751876
[11] F. J. García-Peñalvo, "What Computational Thinking Is," Journal of Information Technology Research, vol. 9, no. 3, pp. v-viii, 2016.
[12] A. Rojas López and F. J. García-Peñalvo, "Relationship of knowledge to learn in programming methodology and evaluation of computational thinking," in Proceedings of the Fourth International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM'16) (Salamanca, Spain, November 2-4, 2016), F. J. García-Peñalvo, Ed. (ICPS: ACM International Conference Proceeding Series, New York, NY, USA: ACM, 2016, pp. 73-77.
[13] F. J. García-Peñalvo, "Cómo entender el concepto de presencialidad en los procesos educativos en el siglo XXI," Education in the Knowledge Society (EKS), vol. 16, no. 2, pp. 6-12, 2015.
[14] F. J. García-Peñalvo, "Formación en la sociedad del conocimiento, un programa de doctorado con una perspectiva interdisciplinar," Education in the Knowledge Society, vol. 15, no. 1, pp. 4-9, 2014.
[15] F. J. García-Peñalvo, "Engineering contributions to a Knowledge Society multicultural perspective," IEEE Revista Iberoamericana de Tecnologías del Aprendizaje (IEEE RITA), vol. 10, no. 1, pp. 17-18, 2015.