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Profiling first-year engineering students: a strategy for academic support

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Abstract

In higher education, particularly in engineering schools, the increase in early dropout rates has been an indicator for questioning possible causes or aspects that affect student retention and success. In this context, establishing strategies for academic support and accompanying students is a priority. Therefore, student profiling is an approach to managing a diverse population for institutions. Research studies have shown that individual, social and attitudinal factors are related to academic performance. Also, the variable gender has been associated with performance and attitudes towards STEM topics. Overall results exposed that academic performance in the first-year transition is a marker of success for engineering students.

Considering this background, the School of Engineering at the Pontificia Universidad Javeriana (PUJ) has developed strategies for the different transitions at the university, especially in the first-year transition. One of these strategies aims to characterize students with a series of tests conducted before the first academic year. The profiling results advise the faculty of possible academic alerts and give guidance for students to reinforce mathematical skills and attitudes. Students are enrolled in an extra-curricular workshop aligned with the first-year math course for building up these skills and encouraging positive attitudes in learning mathematics. Furthermore, the university offers multiple services and facilities for accompanying students as academic counseling, mathematical tutoring, and learning support. Student profiling is crucial to outline targeted actions in the learning process, where professors need to assess students' needs. This strategy permeates the first level of intervention and belongs to a cross-cutting accompaniment strategy for the students' transitions.

Exploratory analyses indicate that self-confidence and motivation in mathematics are factors that impact academic performance. The connection skill and knowledge of algebra are predictors for academic performance in first-year math courses. There are significant differences between gender

in the conducted tests, particularly in self-confidence, self-perceptions of mathematical knowledge, problem-solving, communicating, and representing competencies.

This study presents the research background as an introduction justifying this work. Afterward, the accompaniment strategy designed and implemented at the PUJ is described. Exploratory results and prior considerations for future work are discussed. Finally, some conclusions about academic support and success in engineering students are presented.

Keywords: first-year transition; profiling; STEM

Resumen

En el ámbito de la educación superior, particularmente en las Facultades de Ingeniería, el aumento en las tasas de deserción temprana es un fenómeno que ha generado una discusión en las instituciones educativas acerca de las posibles causas o factores que pueden estar afectando la retención y el éxito estudiantil. En este contexto, resulta una prioridad establecer estrategias orientadas al apoyo académico y al acompañamiento de los estudiantes en la vida universitaria. Por lo tanto, el perfilamiento de estudiantes se considera como un enfoque que le permite a las instituciones acompañar de manera más personalizada una población diversa. Algunos estudios previos han expuesto que los factores individuales, sociales y actitudinales están relacionados con el desempeño académico. También se ha evidenciado que la variable género está asociada con el desempeño y la actitud hacia las temáticas STEM. En general, los resultados indican que el desempeño académico en la transición de primer año en la universidad es un indicador de éxito estudiantil.

Considerando este marco, la Facultad de Ingeniería en la Pontificia Universidad Javeriana (PUJ) ha desarrollado estrategias para las diferentes transiciones de la vida universitaria, principalmente para la transición de primer año. Una de estas estrategias hace referencia a la caracterización de los estudiantes, en la cual se aplican unas pruebas de manera anticipada al ingreso de primer semestre. Los resultados de esta caracterización le permiten a la Facultad identificar posibles alertas académicas y son un mapa de ruta para que los estudiantes fortalezcan sus habilidades y actitudes hacia las matemáticas. Además, en primer semestre los estudiantes de ingeniería son asignados a un taller extracurricular con el objetivo de fomentar el desarrollo de habilidades y la motivación en el aprendizaje de las matemáticas. Asimismo, la Universidad ofrece múltiples servicios y recursos que complementan la oferta de acompañamiento como la consejería académica, tutorías en matemáticas y cursos de apoyo al aprendizaje. En este sentido, el perfilamiento es fundamental para definir acciones dirigidas a diversos segmentos de la población estudiantil en el proceso de aprendizaje, en el cual se requiere que los profesores evalúen las necesidades de los estudiantes. Esta estrategia impacta el primer nivel de intervención y hace parte de la estrategia transversal de acompañamiento en las diferentes transiciones del estudiante.

Los resultados preliminares indican que la autoconfianza y la motivación en matemáticas son factores asociados al desempeño académico. La habilidad de conexión y el conocimiento en álgebra son predictores del desempeño en los cursos de matemáticas de primer año. Se evidencian diferencias significativas en los resultados de las pruebas aplicadas por género, especialmente en el nivel

de autoconfianza, la autopercepción del conocimiento en matemáticas, y las habilidades de resolución de problemas, comunicación y representación.

Este estudio presenta el marco de referencia como introducción, posteriormente se describe el diseño y la implementación de la estrategia de acompañamiento en la PUJ. También se presentan los resultados exploratorios y las consideraciones para el trabajo futuro, y algunas conclusiones acerca del apoyo académico y el éxito estudiantil en ingeniería.

***Palabras clave**: transición de primer año; perfilamiento; STEM*

1. Introduction

The increasing dropout rates are a concern for institutions. Managing a diverse population at university is a challenge that demands designing and deploying a targeted action plan to prevent dropping out. Casanova et al. (2018), Ikuma et al. (2019) and Mujica et al. (2019) refer that student dropout is associated with aspects such as individual, family, contextual characteristics, and academic background (as cited in Casanova et al., 2021). "The rate of dropout is highest in first-year students" (Casanova et al., 2018; Tinto, 2010 as cited in Casanova et al., 2021, p. 595) due to the transition from school to university. Students experience new situations and behaviors, and they deal with academic and non-academic issues. Students overcome difficulties based on their background, some students need more support in learning strategies than in individual aspects. In this context, the adaptation process is decisive for academic success and appeals to developing retention strategies to support first-year students.

At Engineering schools, most of the "students feel disappointed or disillusioned when confronted with the rigor of higher education programs and feel unprepared for the academic demands of math and physics units" (Casanova et al., 2021, p. 596). Consequently, most students underperformed in STEM courses and experience negative attitudes towards mathematics. "Math anxiety has adverse effects such as avoidance of math and underperformance in math" (Ashcraft, 2002 as cited in Daker et al., 2021, p. 1). Therefore, it is important to encourage students for learning mathematics and strengthen their basic skills in the first-year transition. "One way of improving retention and graduation rates among students entering engineering programs is to address their ability to succeed academically in these programs" (Moses et al., 2011, p. 230). Students need to enhance their self-confidence and self-efficacy to ease their performance and increase their motivation in STEM courses. However, the literature suggests "that students who took advanced math and science courses while in high school were more likely to be successful in college" (Robinson, 2003 as cited in Moses et al., 2011, p. 231).

Support and accompanying students in the first-year transition has been a priority for institutions. "An effective measure of how well a student has transitioned to university is the level of academic adjustment to this new environment" (van Rooji et al., 2018, p. 750). Studies have shown that motivation, academic self-efficacy, and self-regulated behavior are related to adjustment. Lynch (2006) and Petersen et al. (2009) indicated that intrinsic motivation is associated with adjustment. De Clercq et al. (2013) affirmed that self-efficacy is a robust predictor of GPA for first-year students

and Hurtado et al. (2007) referred that time management skills were a powerful predictor of academic adjustment. (as cited in van Rooij et al., 2018). Monaci et al. (2012) exposed women report greater social adjustment and motivation to complete a degree, and less self-efficacy (as cited in Morelli et al., 2021). "Successful interaction between a first-year student and the academic characteristics and demands of the university environment can be summarised by the construct of academic adjustment" (van Rooji et al., 2018, p. 751). Thus, students' intention to drop out is often related to dissatisfaction with the university experience (Elsharnourby, 2015; O'Gorman, 2020 as cited in Morelli et al., 2021).

This background requests institutions to understand more reflective the transition to university and how it influences student success, especially in engineering programs.

2. Accompaniment program at PUJ

As a response to dropping out, the university and the Faculty of Engineering have been working jointly in designing and implementing an accompaniment program to support students' transitions. The Accompaniment Program for Students - PAE [For its acronym in Spanish] has focused efforts on the first-year transition considering the adaptation process as a decisive experience for student retention. The PAE was implemented in 2017 and adjustments have been made for strengthening the strategies in line with students' feedback.

The accompaniment strategies designed and implemented at the Faculty of Engineering for first-year students are presented below.

- The Basic Skills Workshop - THB [For its acronym in Spanish] focuses on reinforcing mathematical knowledge and skills.
- The Peer Mentoring Program aims to ease the adaptation process to university. A group of peer mentors (students from middle or ending transition) accompanies and guides the first-year students encouraging self-efficacy, belonging, and autonomy.
- The Induction Program refers to the welcome week. Intentional activities and events are designed to provide students with the services and programs at the university for supporting the ongoing transition.

For approaching the diverse population that enters the engineering academic programs, a profiling strategy was designed to complement the above-mentioned strategies. Student profiling attempts to establish mechanisms for academic support based on students' skills and knowledge development. The strategy focuses on mathematics as the first step in the intervention. The second step includes science and reading skills.

This strategy is structured in three states for its development:

(1) The initial state intends to profile students at the first-year transition for identifying strengths and weaknesses, and attitudes towards mathematics. The characterization results advise

students to overcome learning difficulties. Results are correlated with data from the standardized test Saber 11[1].

(2) The middle state aims to characterize students in the middle transition to assess the improvement in their skills and knowledge.

(3) The final state focuses on profiling students at the ending transition to measure the advance in their skills and knowledge. The results are compared with the standardized test Saber Pro.

Considering that students' dropout rate is higher in the first-year transition, this study presents the exploratory results of the initial state. Profiling first-year engineering students suggest including basic skills and knowledge such as mathematics, science, and reading.

3. Instrument design

Previous studies and international standards were reviewed and considered as a starting point for developing the strategy. National frameworks were also examined to identify the basic competencies in mathematics curricula. International frameworks from the United States and Singapur based curricula in a systematic method to achieve high-quality academic standards in tests (Ministry of Education, 2009; NCTM, 2000; Rodríguez, 2017). Furthermore, students' beliefs and attitudes have been related to math performance. Students' backgrounds and engagement with engineering disciplines influence behavior (Schoenfeld, 1992). Standardized tests such as PISA[2] and TIMSS[3] suggest that self-efficacy, self-concept, interest in mathematics, and metacognition affect mathematical learning (OECD, 2010). These concepts are described in Table 1.

Table 1. Attitudes towards mathematics

Concept	Definition
Self-efficacy	Students' confidence in their ability to solve specific types of math problems. This demands readiness to experience and achieve challenging tasks.
Self-concept	Students' perceptions of themselves (behaviors, abilities, etc.), especially in mathematics performance.
Interest	Students' interest in mathematics. It influences engagement in the learning process (selecting problem-solving strategies, having a deep understanding).
Metacognition	Students' processes for achieving their learning goals. Students define strategies to connect new information to prior knowledge and monitor their learning method and performance.

[1] Saber Pro is the exam that measures quality in higher education and is a requirement for undergraduate students in Colombia.
[2] PISA is administered by the Organisation for Economic Co-operation and Development – OCDE [For its acronym in Spanish] to 15-year-old students. The test measures abilities in reading, science, and mathematical problem-solving.
[3] TIMSS is administered by the International Association for the Evaluation of Educational Achievement – IEA to fourth and eighth-grade students to evaluate achievement in mathematics, science and reading.

Given those frameworks, the characterization survey was designed to evaluate the concepts above-mentioned, and the main mathematical skills and knowledge contents for first-year engineering students were defined for structuring the profiling test. The instruments were evaluated by experts in mathematics education and were conducted in 2021. Table 2 presents the competencies and topics assessed in the test.

Table 2. Profiling test skills and knowledge

Category	Concept	Definition
Skills	Connection	Relations between concepts and procedures with previous knowledge.
	Reasoning	Analysis, argumentation, and formulation of mathematical assumptions.
	Representation	Proper use of mathematical representations such as symbolic, numerical, and graphs.
	Problem-solving	Application of problem-solving strategies in different contexts.
	Communication	Proper use of math notation and its relation to daily language.
Knowledge	Numbers	Integers, fractions and decimals, ratios, proportions, and percentages.
	Algebra	Expressions and operations, equations and inequalities, functions.
	Geometry	Geometric measures, location, and movement.
	Data and probability	Data interpretation.

4. Method

Participants

The study was carried out in the Faculty of Engineering at the PUJ. The test and the characterization survey were applied to all first-year students in the first and the second terms in 2021. The first term refers to the cohort 2021-10 and the second one to the cohort 2021-30.

For the cohort 2021-10, 276 students answered the survey and 218 students applied for the test. The sample for the cohort 2021-30 was 256 and 235 students, respectively. The academic programs in engineering were represented in the sample, but the highest percentage of students were from Systems and Industrial programs, 54% on average.

Procedure

All first-year students were eligible to fulfill the instruments (test and characterization survey) and give their free consent to use data. Students were informed about the profiling strategy objectives and the importance of results to assess their needs in mathematics. Both instruments were self-administered by mail to 445 students in 2021-10 and 304 students in 2021-30. The response rate was around 56% in the first term and 80% in the second term.

The study was conducted in 3 phases: (1) descriptive statistics and regression analysis for test performance, (2) chi-squared test to identify the association between survey variables, and (3) regression analysis for first-year math performance.

Data Analysis

Data were analyzed using the SPSS software v.26. The overall test performance rates are presented and significant differences between the academic programs are given. A regression model was

used to identify possible predictors for the skills and the topics evaluated in the test. Some survey items were coded to reduce the number of categories for applying the chi-squared test. The variables with a higher association are presented and the preliminary predictors for performance in first-year math courses are shown.

5. Results

The test performance rates are presented in Figure 1 for the whole sample in the cohort 2021-10 and the cohort 2021-30. The results show that cohort 2021-30 reported a higher performance in most mathematical skills and knowledge areas than cohort 2021-10. In general, representation and problem-solving are the main skills needed to build up in the curricular courses and the THB. Most of the students enrolled at the Faculty of Engineering have a great performance in connection and reasoning skills. These competencies are related to connecting new concepts and procedures to previous knowledge and applying critical thinking to figure out the problem-solving strategy, respectively. Overall results showed a good performance in algebra, where the cohort 2021-10 has a higher rate. Geometry and numbers have similar behavior for the cohorts analyzed.

Data reported by programs show that Electronics Engineering has a higher performance rate in skills for the cohort 2021-10. Civil Engineering reported a good performance for most knowledge areas in 2021-10. For the cohort 2021-30, Bioengineering has greater performance in most of the skills and all knowledge areas.

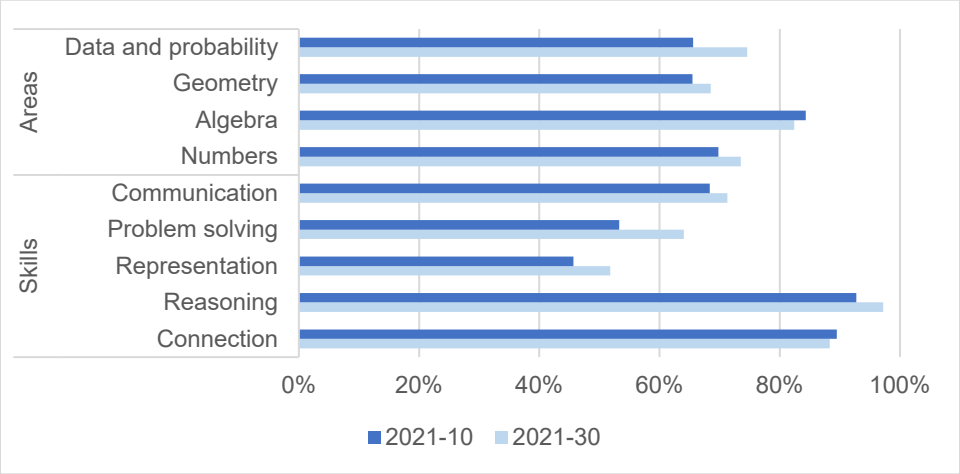

Figure 1. Profiling test performance rates

For identifying possible test performance predictors, a regression analysis was conducted. The variables included in the model are listed below: Saber 11 score, Saber 11 mathematics score, Saber 11 reading score, math test performance (test designed by the Department of Mathematics at the PUJ), classification of high school, and academic program. The model summary and the coefficients are presented in Table 3. For the cohort 2021-10 the possible predictors for the test performance are the Saber 11 overall score and the math test performance. For the cohort 2021-30 the model included the above-mentioned variables and the academic program as preliminary predictors. The

most important variable for the cohort 2021-10 is Saber 11 score (β=0.402). For the cohort 2021-30 the math test performance (β=0.340) has the greater weight in the model.

The results suggest that the profiling test measures competencies related to those evaluated in the Saber 11 and the math test.

Table 3. Profiling test regression model.

Model summary	2021-10	2021-30
R squared	0.285	0.321
Adjusted R squared	0.277	0.310
Std. Error of the Estimate	0.74571	0.57137

	2021-10					2021-30				
Variable	B	Std. error	β	t	Sig.	B	Std. error	β	t	Sig.
Saber 11 score	0.009	0.002	0.402	5.845	0.000	0.007	0.001	0.329	4.908	0.000
Math test performance	0.197	0.060	0.227	3.301	0.001	0.270	0.053	0.340	5.073	0.000
Academic program						0.048	0.023	0.130	2.067	0.040

For analyzing the association between variables in the characterization survey, a chi-squared test was performed. The most significant symmetric measures of associations and variables are presented in Table 4. The results show that self-confidence influences most survey variables such as self-perceptions in algebra and problem-solving, passion for mathematics, perception of high school math performance, and self-concept in math knowledge. The cohort 2021-10 reported more associations than the cohort 2021-30. Self-confidence is related to self-concept, the perception of problem-solving skills, and algebraic manipulation for both cohorts. The analysis for the cohort 2021-10 showed that passion for mathematics is associated with the utility of math, self-confidence, and self-concept. The cohort 2021-30 reported that self-concept is related to the self-perception of problem-solving skills.

Table 4. Chi-squared symmetric measures for characterization survey.

Item code	Variable	2		3		6	12	14	16		21	
		2021-10	2021-30	2021-10	2021-30	2021-10	2021-10	2021-10	2021-10	2021-30	2021-10	2021-30
2	Perception of algebraic manipulation			0.606					0.790	0.680	0.693	
3	Perception of problem-solving skill	0.606							0.635	0.631		0.618
6	Passion for mathematics							0.751	0.655		0.676	
12	Average performance in high school								0.701			
14	Utility of mathematics					0.751						
16	Self-confidence	0.790	0.680	0.635	0.631	0.655	0.701				0.844	0.651
21	Self-concept	0.693			0.618	0.676			0.844	0.651		

The regression analysis for first-year math performance is presented in Table 5 and Table 6 for each cohort. The stepwise model was conducted including variables listed as follows: profiling test performance, math test performance, Saber 11 score, Saber 11 math score, classification of high school, the participation rate in THB, first-year math courses (calculus and algebra) performance, and assigned professor, variables listed in Table 4, the skills and knowledge assessed in the profiling test, academic program, and gender.

The overall results show that the model fit varies between 21% and 34%. For each cohort, there are differences among the possible predictors for first-year math courses. Algebra knowledge is the only common predictor for the algebra course in both cohorts. The participation rate in THB is a predictor for calculus and algebra performance in the cohort 2021-10. The preliminary predictors for calculus performance in the first term are related to the Saber 11 score, the average performance in high

school, the participation rate in THB, and data and probability knowledge. On the contrary, the results for the second term reported that calculus performance predictors are the connection skill, Saber 11 math score, the math test performance, and passion for mathematics. In the cohort 2021-10, algebra performance is associated with self-concept, algebra knowledge, the participation rate in THB, and the academic program in engineering. In contrast, the preliminary predictors for the cohort 2021-30 are the Saber 11 score, algebra knowledge, and the perception of obstacles in problem structure.

In general, the regression models for first-year math performance include variables associated with high school performance and the entrance tests. Exploratory results indicate that profiling test variables such as the connection skill, data and probability, and algebra knowledge are relevant for math performance. Self-concept and passion for mathematics are possible predictors that influence academic performance.

Table 5. First-year math performance regression model for cohort 2021-10.

Model summary	Calculus	Algebra
R squared	0.231	0.374
Adjusted R squared	0.210	0.341
Std. Error of the Estimate	0.55196	0.52384

CALCULUS

	2021-10				
Variable	B	Std. error	β	t	Sig.
Saber 11 score	0.003	0.001	0.166	2.102	0.037
Participation rate in THB	0.480	0.132	0.261	3.644	0.000
Average performance in high school	0.228	0.093	0.186	2.457	0.015
Data and probability knowledge	0.442	0.199	0.166	2.219	0.028

ALGEBRA

	2021-10				
Variable	B	Std. error	β	t	Sig.
Participation rate in THB	0.925	0.197	0.475	4.690	0.000
Self-concept	0.383	0.099	0.363	3.875	0.000
Academic program	-0.087	0.034	-0.261	-2.541	0.013
Algebra knowledge	0.880	0.381	0.218	2.309	0.024

Table 6. First-year math performance regression model for cohort 2021-30.

Model summary	Calculus	Algebra
R squared	0.358	0.267
Adjusted R squared	0.332	0.235
Std. Error of the Estimate	0.62434	0.54536

CALCULUS

	2021-30				
Variable	B	Std. error	β	t	Sig.
Connection skill	1.797	0.458	0.335	3.925	0.000
Saber 11 mathematics score	0.018	0.008	0.204	2.303	0.023
Passion for mathematics	0.367	0.13	0.233	2.825	0.006
Math test performance	0.173	0.082	0.194	2.100	0.038

ALGEBRA

	2021-30				
Variable	B	Std. error	β	t	Sig.
Saber 11 score	0.007	0.002	0.302	2.825	0.006
Obstacles in problem structure	-0.192	0.071	-0.283	-2.716	0.008
Algebra knowledge	0.981	0.414	0.253	2.367	0.021

For identifying differences between gender in the conducted tests, contingency tables were performed. Exploratory results indicate that women have low self-confidence and self-perception of mathematical knowledge, and low performance in skills including problem-solving, communication, and representation. In general, men have a greater performance in mathematics competencies

6. Conclusions

Student dropout has been a concern for institutions. The increasing rates of first-year students are questioning universities to design and carry out accompaniment strategies for supporting the transition from school. For characterizing a diverse population, profiling students is an approach that leads institutions to assess students' needs. The results showed that attitudinal factors such as self-confidence, self-concept, and motivation toward mathematics are crucial for engaging first-year students in engineering classes. This strategy is the first step to continuing the design of tests associated with STEM issues, particularly in science and reading skills.

Overall results provide a route to overcome challenges and increase student retention in engineering. One of the challenges that institutions need to deal with is the teaching method in mathematics because this factor influences students' motivation and self-efficacy. Active and situated learning is important to connect math concepts to the real context. In this sense, a methodology based on problem-solving can persuade students to have a positive attitude in math courses. A second challenge refers to level-up students that have low performance or difficulties in science and mathematics for warning drop-out or academic failure. In this context, is important to develop autonomous learning and self-regulated strategies. A final challenge is to foster positive actions in mathematics classrooms where women participate actively in math projects.

7. References

- Casanova, J. R., Vasconcelos, R., Bernardo, A. B. & Almeida, L. S. (2021). University Dropout in Engineering: Motives and Student Trajectories. Psicothema, Vol. 33, No. 4, pp. 595-601. https://doi.org/10.7334/psicothema2020.363
- Daker, R. J., Gattas, S. U., Sokolowski, H. M., Green, A. E. & Lyons, I. M. (2021). First-year students' math anxiety predicts STEM avoidance and underperformance throughout university, independently of math ability. npj Science of Learning, Vol. 6, No. 17, pp. 1-13. https://doi.org/10.1038/s41539-021-00095-7
- Ministry of Education. (2009). The Singapore Model Method for Learning Mathematics. Curriculum Planning & Development Division, Singapore: EPB Pan Pacific.
- Morelli, M., Chirumbolo, A., Baiocco, R., & Cattelino, E. (2021). Academic failure: Individual, organizational, and social factors. Psicología Educativa, Vol. 27, No. 2, pp. 167-175. https://doi.org/10.5093/psed2021a8
- Moses, L., Hall, C., Wuensch, K., De Urquidi, K., Kauffmann, P., Swart, W., Duncan, S. & Dixon, G. (2011). Are Math Readiness and Personality Predictive of First-Year Retention in Engineering?. The Journal of Psychology, Vol. 145, No. 3, pp. 229-245. https://doi.org/10.1080/00223980.2011.557749
- NCTM (2000). Principles and Standards for School Mathematics. Reston, VA: NCTM.
- OECD (2010). Mathematics Teaching and Learning Strategies in PISA. PISA, OECD Publishing, Paris. https://doi.org/10.1787/9789264039520-en
- van Rooij, E. C. M., Jansen, E. P. W. A., & van de Grift, W. J. C. M. (201). First-year university students' academic success: the importance of academic adjustment. European Journal of Psychology of Education, Vol. 33, No. 4, pp. 749-767. https://doi.org/10.1007/s10212-017-0347-8
- Rodríguez Gómez, R. (2017). Matemáticas en países asiáticos: El caso de Singapur. Retrieved from: https://www.educacionfutura.org/matematicas-en-paises-asiaticos-el-caso-de-singapur/

- Schoenfeld, A.H. (1992). Learning and Thinking Mathematically: Problem Solving, metacognition, and sense-making in Mathematics. In D. Grouws (Ed.), Handbook of Research on Mathematics Teaching and Learning. New York: MacMillan.

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