DiplomaTec: An experimental and gamified tool that contributes to vocational guidance and career decision-making for high school students

Ricardo Ipiña Sifuentes*
School of Engineering and Sciences, Tecnologico de Monterrey
ricardo.ipina@tec.mx

Guillermo Manuel Chans
Institute for the Future of Education, Tecnologico de Monterrey
guillermo.chans@tec.mx

ABSTRACT

Currently, between 30% and 40% of students in Mexico choose the wrong academic program, and many drop out for this reason. Particularly at Tec de Monterrey, students go through an "exploration" phase during the first semesters that helps them receive more academic information and can even change to another program. The behavior of students at the School of Engineering (a school that represents 50% of the total number of students) was analyzed during 2019-2021. At the beginning of the study, during the exploration phase, about 26% of them switched from one academic program to another. Considering the studies that identify that the key for students to make a better career decision is related to is to be informed and advised, the DiplomaTec program was created, which is a tool for high school students where they can take lectures, workshops, orientation tests, tours, etc., that help them decide based on what they like and are passionate about. As a result of the implementation in this school at Monterrey Campus, during the last three years, the percentage of students who shift careers during their exploration phase (first three semesters) has decreased to 18%.

CCS CONCEPTS

• **Applied computing**; • **General and Reference**; • **Computer systems organization**;

KEYWORDS

Educational Innovation, Career Decision-Making, Vocational Guidance, Gamification, Higher Education, Freshmen, High School

ACM Reference Format:
Ricardo Ipiña Sifuentes* and Guillermo Manuel Chans. 2023. DiplomaTec: An experimental and gamified tool that contributes to vocational guidance and career decision-making for high school students. In *The 7th International Conference on Education and Multimedia Technology (ICEMT 2023), August 29–31, 2023, Tokyo, Japan.* ACM, New York, NY, USA, 5 pages. https://doi.org/10.1145/3625704.3625709

1 INTRODUCTION

In Mexico, 7 out of 10 high school students do not know which university degree to select, and once they decide, 40% of young Mexicans make a mistake in their choice. Many of them abandon their university studies altogether [1]. To support students, teachers at the high school level in charge of teaching subjects have made a great effort to provide talks, vocational orientation exams, and activities [2] to discover their skills and strengths [3].

The risks of a wrong choice of a degree program are manifold and range from frustration and dropout to subsequent underemployment [4, 5]. This election is a complex decision that is not made overnight or through the measurement of a single instrument; it is an intricate process that requires time, research, and expert advice that allows the students to reflect not only on what degree they are going to choose but also visualize themselves through a complete life project in which they can see themselves thrilled in a challenging and exciting work environment.

In today's organizational environment, happiness is paramount for anyone to succeed (they must be passionate about what they do every day). Consequently, that same happiness becomes equally crucial for organizations to succeed as well [6]. If employees are in good spirits while working, it will increase their productivity, and the impact on the company where they work will be even more significant. In summary, the correct choice of the academic program contributes to the proper election of career opportunities for each individual [7].

Around 3,500 students enter Tec de Monterrey Campus Monterrey at a professional level every year. On average, 49% come from Tec high schools, 41% from different high schools around the country, and 10% are international students (from now on, the last 2 groups together will be called non-Tec high school students). All of them live the educational model [8], which consists of 3 phases throughout the 8 semesters that the degrees last: (1) the exploration phase, (2) the focus phase, and (3) the specialization phase. During the first 3 semesters of the exploration phase, students get to know the curriculum; meanwhile, they must take some courses that help them explore the different academic programs offered by the university; this phase culminates with the decision of the degree program that they will study or the confirmation of the chosen degree program at the beginning of the admission process. Once the focus phase begins, they take subjects related to the chosen academic program. And finally, during the specialization phase, students can focus on a relevant topic that interests them and helps them to select the work they are passionate about more confidently.

When students are admitted to the institution and the exploration phase begins, they do not need to decide which degree to choose; they opt for an "area of study". This allows them to make a more straightforward initial decision, and as they progress through this first phase, they become more informed so that at the end of

ICEMT 2023, August 29–31, 2023, Tokyo, Japan

ACM ISBN 979-8-4007-0914-2/23/08.
https://doi.org/10.1145/3625704.3625709

this stage, they can choose the academic program with greater precision. There are 6 areas of study [9], which contain all the degree programs:

- Built Environment (which contains programs such as Urbanism and Architecture)
- Business (with programs such as Marketing and Finance)
- Creative Studies (with programs such as Communication and Design)
- Engineering and Science (with programs such as Nanotechnology, Industrial, and Computer Technologies)
- Health (with careers such as Clinical Psychology and Nutrition)
- Law, Economics, and International Relations (with programs such as Law and Economics)

Undoubtedly, the more information and experiences related to students' academic programs, the more likely they will choose the right one. However, it is essential to recognize that internal aspects of the person, such as self-efficacy [3] and self-knowledge [10], are also fundamental for these decisions.

Different studies exhibit that offering various supports to students, such as counseling programs [3, 11], activities that show them what the job of a graduate of any career is like, and visits to organizations and industry help in subsequent degree selection. Nevertheless, to our knowledge, we are unaware of any program that brings all these strategies together in one place and makes it attractive to the student. For this reason, we have created a web page that, in a gamified way, awakens high school students' interest in learning about the different academic programs that exist through various activities.

1.1 OBJECTIVE

To develop a free website called "DiplomaTec", aimed at high school students of all semesters who seek to orient themselves and strive to strengthen their vocation through activities such as talks, workshops, and open classes that allow them to learn more about the areas of study and the different degrees that exist at Tec de Monterrey.

1.2 METHODOLOGY

The program is developed in 5 phases or competences. DiplomaTec help students in their search for professional orientation through the development of these 5 stages:

1. Knowing how to be: through the activities included here, students learn to know themselves and to recognize their interests and what they are passionate about.

2. Knowing: the critical element in this competency is that students learn about all the degrees, then focus on the specific ones and delve deeper into those of most significant interest. This will allow them to refine their decision-making.

3. Knowing how to do: this is the most valuable competence because it is where students carry out assignments directly related to their careers; i.e., they manage to apply the theoretical concepts of each career in actions that help them discover if that career suits them or not.

4. Being able to do: these activities encourage students to approach the careers in which they are interested differently, manipulating the tools they will be able to use and the places where they can work.

5. Transcend: the tasks in this competence give students a clear vision of what they will do once they graduate by talking to graduates and visiting organizations.

This program is for all students currently studying high school, in any semester, in any state in the country's northern region, both Tec high schools and non-Tec high schools. Students can take activities that provide sufficient information and experiences for their correct career choice. In addition, they can obtain a certificate from Tec de Monterrey. Every time students sign up for a task in this gamified system, they earn points that eventually help them obtain a certification in a particular area of study. The earlier the students enroll in the program, the sooner they can begin taking assignments and earning points toward the diploma. There are seven different types of diplomas: (1) Built Environment, (2) Law, Economics, and International Relations, (3) Creative Studies, (4) Engineering, (5) Business, (6) Health, (7) Multidisciplinary Diploma (to obtain this diploma, the activities do not need to be from the same area of study but must belong to different competences). Students must achieve 150 points for all five competences and meet a certain number of points as a minimum for each competence through a series of activities offered to students in each of the five competencies, as shown below:

1. Knowing how to be (20 points)

•Vocational orientation test (with their professional and vocational profile, participants will discover the academic programs that best suit them)

•Vocational talk (short talks about discovering their professional life skills and passions)

•Informative appointment with an academic advisor (talk about their interests, the six areas of study, and all degree programs)

2. Knowing (30 points)

•Open class (attendance as an observer in an in-person or online professional class of their interest)

•Conferences with a guest expert in the area or discipline (attendance at an in-person or online conference to learn about the field and its trends from a specialist)

•Activity organized by associations external to Tec de Monterrey (conventions or talks to learn more about the academic programs)

3. Knowing how to do (50 points)

•Workshop (students will attend a hands-on workshop to develop skills in the discipline of their interest)

•Challenge (students will work on solving a challenge to generate a proposed solution for a given problem)

•Open lab (attendance to an in-person or online class/visit to a lab of their interest)

4. Being able to do (30 points)

•Informative session (to learn about Tec's educational model and the differentiators of this institution)

•Tec Tour (guided visit by Tec ambassadors to the campus facilities)

•Entrepreneurship talks (talks with Tec students focused on entrepreneurship)

Figure 1: Main page of the DiplomaTec program.

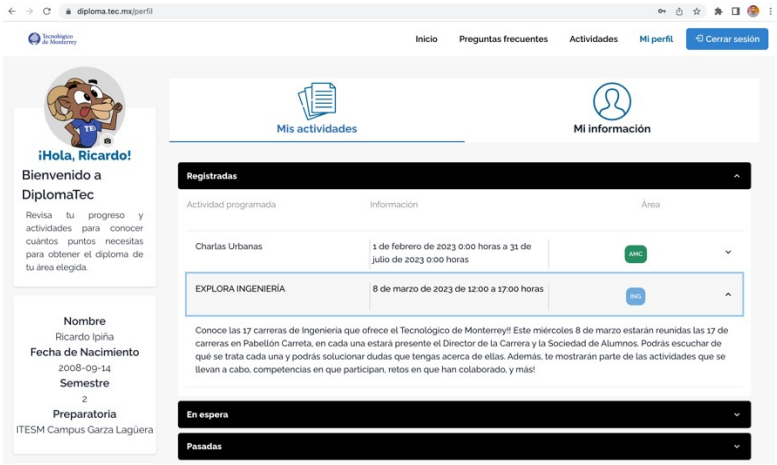

Figure 2: Student dashboard.

•Talks about experiences of Tec students (talks with students who have already had professional backgrounds in Mexico and abroad due to internationalization)

5. Transcend (20 points)

•Talks with EXATEC professionals (talks with professionals on topics related to the work they do and the discipline they are interested in)

•Visits to organizations (in-person or online visits to companies, governmental institutions, and non-governmental organizations, among others)

The website [12] offers all possible activities, indicating to which competence they belong and how many points can be obtained for completing them. Students are encouraged to register as users. The system allows them to view the assignments, check how many points they have accumulated, and remind them each time they enroll for a new task that may interest them. The main page of the Diplomatec program can be seen in Figure 1 and the dashboard that students use to view and manage their activities is in figure 2. Every time the Diplomatec coordinator registers a new activity, it is also defined how many points the activity will be worth, very often the value of the activity is assigned by the time that the student will take to complete the activity, the points assigned can be 10, 20 or 30. The coordinator also sends information to the students about when and where the event will take place and the modality (in-person or online) and ensures that they will have an excellent experience from start to finish. If a participant registers and does not attend without canceling the activity, the points for that activity are subtracted.

A process map (Fig. 3) was developed to guarantee that the program operates in a standardized way. The map shows the target audiences for the program (in this case, they are high school students), the Guiding Processes (that indicate the strategy to be followed by Diplomatec), the Operational Processes (processes that need to be done for Diplomatec to work), and the Enabling Processes (all the processes and tools that support Diplomatec).

At the start of the study, all activities were conducted face-to-face; but due to the pandemic, they were moved online in March 2020. In March 2022, face-to-face activities were partially initiated.

The study design was cross-sectional and instrumental [13, 14]. We applied a survey to 725 students by e-mailing them with the following profile to evaluate the website's impact on their vocational decision-making:

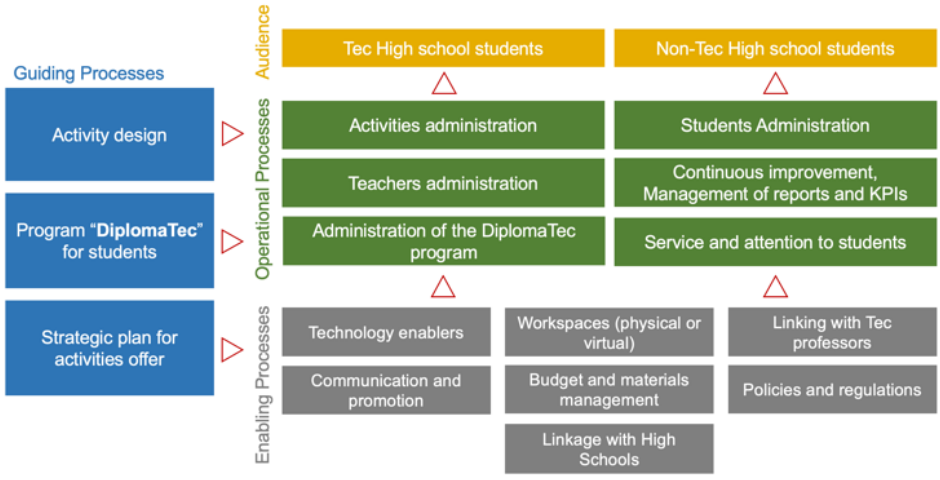

Figure 3: Process map to ensure the successful implementation of DiplomaTec.

Students currently in high school

Students who participated in at least three activities during the year

Students with all the information in their system profile

The survey was implemented in June 2020. Participation was voluntary. The applied material consisted of informed consent and the study instrument, which consisted of 8 questions shown below. The first three questions have the answers: Very high, High, Low, and Very low. In the other ones, the possible responses are indicated in parentheses.

At what level have the activities you have attended contributed to your vocational orientation?

How would you rate the performance of the teachers?

How would you rate the quality of the service provided by the program coordinators? (response time, allocation of points, attention in general).

What kind of activities do you consider to be the most beneficial for choosing a career? (13 different options, including visits and tours, conferences and talks, workshops, and vocational tests, among others).

What elements do you consider most relevant when carrying out an activity? (1 being the most critical element and 6 being the least). (Teacher, Content, Facilities, Timetable, Duration, Attention by the coordinator).

How clear is the information on obtaining the points and the diploma? (Strongly agree, Agree, Disagree, and Strongly Disagree).

What format do you prefer to take the activities offered by DiplomaTec? (In-person, Virtual, Both).

Do you agree that diplomas should be offered by area of study, or do you prefer a multidisciplinary approach? (By area of study or Multidisciplinary).

We obtained authorization from the directors of the Admissions Department of Tecnológico de Monterrey to evaluate the students for this purpose.

1.3 RESULTS AND DISCUSSION

The number of students who arrive at Campus Monterrey each year without being sure of their career choice is 30%. They usually select only one of the six areas of study, without choosing a definitive academic program yet. Since the creation of DiplomaTec, more than 250 activities are open and free of charge each year for students. The annual participation is of about 3,500 students/activity.

A total of 155 participants (21%) completed the survey. The main results were as follows:

•90% believe that DiplomaTec contributed to their vocational orientation at a high or very high level.

•96% say that the teachers' performance is high or very high.

•94% rate the quality of the service of the coordinators as high or very high in all the items asked.

•Respondents think that the activities that contribute the most to their vocational orientation are workshops (116 votes), open classes (97 votes), and talking with an expert (86 votes).

•124 participants preferred the content of the activity as the first or second choice. Teachers (90 votes) and the planned activities' schedule (35 votes) are the next most important.

•88% consider the gamification system clear and attractive (strongly agree/agree). In addition, they believe that the points given for each type of activity are correct.

•53% prefer to take the activities in person. 38% say they do not care about the modality (in-person or online).

•77% prefer to obtain their diploma by area vs. multidisciplinary. The rest of the participants choose to have the option of a multidisciplinary certificate.

As can be seen, in general, most students value and take advantage of DiplomaTec to learn more about academic programs to finally make their career decision in a more informed manner.

Analyzing participants' behavior at the Engineering School during the last 3 years, the percentage of students who change careers during their exploration phase at the Monterrey Campus has decreased as follows (Table 1).

Table 1: Percentage of students who changed from one academic program to another.

Year in which students entered Tec	Percentage of students who changed career
2019	26%
2020	22%
2021	18%

Currently, DiplomaTec is not linked to the admissions and student tracking systems. Consequently, it was impossible to track the behavior of students during this project (such as if they changed their academic program). Although we do not have enough information to corroborate that DiplomaTec is the cause of this decrease, this result gives us hope that the system works. For this reason, our next step will be to make the connection between our program and the student tracking system to visualize its impact in a quantitative way. Additionally, considering the survey results, we expect to offer the multidisciplinary diploma to the students very soon.

As can be deduced, combining knowledge based on the five competences helps students to get informed and live experiences that allow them to make more knowledgeable decisions. Undoubtedly, teachers play a crucial role in this process since, without them, this program would be impossible to carry out; it is essential to have the support of inspiring teachers who advise and reassure students to make this critical resolution in their lives.

1.4 CONCLUSIONS

The focused accompaniment that is provided to the students at this stage is increasingly important and relevant since they have much information at their fingertips, and this could, instead of helping them, confuse them even more. That is why tools such as DiplomaTec, where everything is concentrated in one place, support them in developing the five competences that ultimately enable them to make their career decision in an informed manner.

Additionally, it is essential to leverage technology to enhance the impact on a more significant number of students. The pandemic contributed to exploring learning and sharing knowledge with platforms such as Zoom [15], Skype™ calls, or Microsoft ®Teams. With this technology, experiential learning in classrooms and laboratories contributes better to students putting knowledge into practice and more meaningful interaction with the teacher. Also, these platforms allow people who could not attend our facilities due to distance and time problems to do it with a single click.

ACKNOWLEDGMENTS

The authors would like to acknowledge the financial support of Writing Lab,Institute for the Future of Education, Tecnologico de Monterrey, Mexico, in the production of this work.

REFERENCES

[1] Instituto de Investigación en Psicología Clínica y Social (IPCS) y Vocación Central. www.iipcs.net/ (accessed December 2, 2022).
[2] Cîrtiță-Buzoianu, C.; Cojocariu, V.-M.; Mareș, G., Motivational Essay - A Useful Tool in Career Choice? Postmodern Openings 2021, 12 (4), 42–61. https://doi.org/10.18662/po/12.4/360
[3] Crișan, C.; Turda, S. In The Impact of a Career Counseling Program over Adolescents' Career Indecisiveness, European Proceedings of Social and Behavioural Sciences, Babes-Bolyai University Cluj-Napoca, Romania, V. Chis, I. A., Ed. Future Academy: Babes-Bolyai University Cluj-Napoca, Romania, 2016; pp. 123–130.
[4] More, S.; Rosenbloom, T., Job-field underemployment and its impact on the demand for higher education at the Israeli labor market. Israel Affairs 2022, 28 (2), 316–334. https://doi.org/10.1080/13537121.2022.2041832
[5] Cordeiro, P. M.; Paixão, M. P.; Lens, W.; Lacante, M.; Luyckx, K., Cognitive–motivational antecedents of career decision-making processes in Portuguese high school students: A longitudinal study. J. Vocat. Behav. 2015, 90, 145–153. https://doi.org/10.1016/j.jvb.2015.08.005
[6] Xin, L.; Zhou, W.; Li, M.; Tang, F., Career Success Criteria Clarity as a Predictor of Employment Outcomes. Front. Psychol. 2020, 11. https://doi.org/10.3389/fpsyg.2020.00540
[7] Oswald, A. J.; Proto, E.; Sgroi, D., Happiness and Productivity. J. Labor Econ. 2015, 33 (4), 789–822. https://doi.org/10.1086/681096
[8] Instituto Tecnológico y de Estudios Superiores de Monterrey Modelo Educativo Tec21; 2018.
[9] Undergraduate admissions - Academic programs. Tecnológico de Monterrey. https://tec.mx/en/undergraduate/academic-programs (accessed December 2, 2022).
[10] Abdullah, N.; Hussin, N.; Shonubi, O. A.; Ghazali, S. R.; Talib, M. A., Career Decision-Making Competence, Self-Knowledge, and Occupational Exploration: A Model for University Students. J. Tech. Educ. Train. 2018, 10 (1).
[11] Faria, L.; Rodrigues, C., Group career counseling: a methodology for vocational intervention in adolescents. In 3rd International Conference on Education and New Learning Technologies, Barcelona, Spain, 2011; pp. 5589–5596.
[12] DiplomaTec. https://diploma.tec.mx/ (accessed December 2, 2022).
[13] Ato, M.; López, J. J.; Benavente, A., Un sistema de clasificación de los diseños de investigación en psicología. Anales de Psicología 2013, 29, 1038–1059.
[14] León, O. G.; Montero, I., Sistema de clasificación del método en los informes de investigación en Psicología. Int. J. Clin. Health Psychol. 2005, 5 (1), 115–127.
[15] Zoom. zoom.us (accessed December 2, 2022).