TURNING SOCIOCULTURAL BACKGROUND DIFFICULTIES INTO AN EDUCATIONAL OPPORTUNITY

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Abstract. The Chilean university system has programs that accept students with low standardized test scores, leading to inadequate preparation and a higher dropout potential. However, these students may have valuable sociocultural experiences that can be transformed into contextual skills. A teaching/learning methodology was designed and evaluated to address these gaps and motivate students to achieve university-level objectives through "meaningful learning". The methodology involved using quantitative tests and qualitative surveys to identify contextual skills. Strategies were then developed to guide students in applying these skills to classroom problems. The approach was tested in four courses in the Architecture program at Universidad Tecnológica Metropolitana, with a control section and an experimental section for each course. In the experimental section, students with higher levels of contextual skills led small groups with lower levels of development in those skills. The results showed improvements in the average grades of the experimental section compared to the control section in three out of the four courses. Additionally, most students showed significant improvements compared to their scores on standardized tests. This methodology has the potential to enhance the construction of concepts and facilitate "meaningful learning" by leveraging students' previous sociocultural contextual learning for a successful university experience.

Key words: meaningful learning, contextual methodology, teaching innovation, experimental learning

Introduction

Many students were given the opportunity to pursue their education thanks to Chile's free higher education for 60% of the population with lower incomes. However, from a purely academic standpoint, a sizeable portion of students lack the language and math proficiency required to guarantee a university's long-term viability. Studies have shown that social vulnerability, poor study habits, or poor math grades at the Test of Selection to University or "Prueba de Selección Universitaria" (hereinafter PSU) are all associated with first-year dropouts at the Universidad Tecnológica Metropolitana (hereinafter UTEM). Additionally, social changes, globalization, access to information, and technological advancements that architecture teaching/learning has been subject to for many years, have caused significant changes on strategies being used until today. The emphasis is now on the students rather than the professor, specifically his knowledge, and his concepts. Constructivist teaching methodologies frequently replace conventional behavioral or instructional models in favor of tailored teaching strategies that emphasize the significance of context for learning (Shareef and Farivarsadri, 2020; Pande and Bharathi, 2020). According to a social constructivist theory, learning is the result of students' interactions with their social and cultural context, giving prior experiences new significance or new "meaningful learning". Activities need to be created to allow students to forge new connections (Rasheed *et al.*, 2023; Nardo, 2021). In this way, the university must respond to the transformative nature of learning by establishing an environment that will help students achieve a more important objective: developing thoughtful, critical thinkers who can deal with a world that is constantly changing. To encourage students to participate in their own processes of observation and analysis, it is necessary to find learning environments with the right interactions and practices. Environments that are adaptable or realistic are required to enable material experimentation or the creation of prototypes. When learning is centered on the individual student through self-directed experimentation, the deepest levels of learning are possible and can be shared as experiences among peers (Carvalho *et al.*, 2020).

In this regard, researchers question whether the "meaningful learning" methodology and, more specifically, the fact that individuals are aware of their own cultural codes, facilitate the development of concepts during the early stages of an In In this regard, researchers question whether the "meaningful learning" methodology and, more specifically, the fact that individuals are aware of their own cultural codes, facilitate the development of concepts during the early stages of an architectural career. Considering developing a model of "meaningful learning from sociocultural context" for the UTEM's first scientific and technological cycle (initial) of the career of architecture, as shown in Fig 1. In this way, this paper offers a methodology for creating and assessing teaching/learning arrangements using the previous approach. Choosing team leaders based on their prior knowledge or leadership skills meant creating activities where some academic criteria were measured while also taking the students' condition into consideration. Some didactic strategies were created by considering the students' prior experiences in order to increase their capacity for acquiring new concepts and abilities for the workplace.

The theoretical framework that supports the methodology that this research suggests and provides a critique of the conventional model is presented at the beginning of this paper. The background of the Case Study is then thoroughly explained. The design of the research methodology that was evaluated and the explanation of the analysis process used are both found in section 2.2, innovative methodology. The research's findings are then presented in a chronological order of the subjects examined. A summary of the findings and their relationship to previously published theoretical papers that have been revised are presented as the paper's conclusions.

1. Theoretical frame

Three main issues are thought to highlight the knowledge gap that needs to be filled for the theoretical framework: 1) the context of higher education in Chile, 2) the educational theory that serves as the basis for the methodology under evaluation, and 3) the subject of teaching architecture as a particular subject for discussion.

1.1. Permanence and accessibility at Chilean universities

Inequalities resulting from each student's cultural background and a teaching/learning methodology that leads to a finite set of knowledges and skills are the main characteristics of access to and guaranteed persistence in the Chilean higher education system in relation to this research.

On the one hand, students from underprivileged backgrounds who must pursue higher education have many comparative cognitive disadvantages. Contrarily, in other instances, the relationship between Socioeconomic Status (SES) and academic achievement has been achieved thanks to investment and politic education (Silva-Laya *et al.*, 2020; Liu *et al.*, 2020). Because of gaps caused by social and cultural inequalities in Chile, as in many other nations, higher education has not been able to significantly reduce inequalities (Buckner and Abdelaziz, 2023); rather, it appears to have been reducing social mobility (Quiroz *et al.*, 2022). Students with a lower sociocultural background have a lower chance of success, whereas the group in the nation with the highest social economic condition has greater access to higher education and is also able to stay and have professional success (Espinoza *et al.*, 2023).

On the other hand, a conductist system of teaching/learning is prevalent in many undergraduate institutions in Chile, where the professors merely impart their knowledge to the students (Celedon Gamboa *et al.*, 2022). The previous one is in addition to the fact that teaching strategies have historically only been sustained by the growth of linguistic and "logical-mathematical intelligence" (Attwood, 2022). Even now, entrance to universities is determined by standardized tests that only evaluate past performance and no other factors that might be more important for a holistic education.

The universal and guaranteed access to higher education for 60% of the population with lower income (Chilean educational reform of 2014) has nevertheless allowed a diverse group of students without a consolidated set of skills to access higher education careers (Espinoza *et al.*, 2022). In this regard, teaching/learning methodologies in higher education must consider these traits and give weight to other characteristics of students that have not

received as much attention in the past. By breaking with the patterns of delay or abandonment of the most vulnerable students, they help define new strategies for addressing the underlying issues that obstruct learning.

1.2. Social constructivism and "meaningful learning"

Epistemological foundations of social constructivism are particularly helpful in addressing the issue that was previously raised. The theory of "multiple intelligences", as grouped by Gardner and cited in Shyamala Bharathy *et al*. (2023), views subjects as the creators of their own knowledge, looks for factors that make it easier for students to understand difficult concepts, and proposes subjects as skills related to various human capacities. Particularly in fields connected to the arts, this approach is extremely pertinent. For instance, to be a great concertist, one needs to have a highly developed musical intelligence. One cannot have both a highly developed musical intelligence and a highly developed mathematic or linguistic intelligence (Winarti *et al.*, 2019).

According to social constructivism, cognitive, social, and affective aspects of behavior are created every day because of interactions between students and their social and cultural context (Knapp, 2019; Knoeferle *et al.*, 2022). These interactions are what lead to the construction of behavior. "Meaningful learning" will be produced by the knowledge that results from an individual's interaction with their environment and its sociocultural components (Nardo, 2021).

To comprehend this phenomenon, two concepts are essential. First, there is the idea of "recontextualization", which is the process by which an object, event, or concept's significance and function are altered when they are placed in a new context. Van Oers, cited in Guile (2019), first proposed this idea to explain why Vygotsky used a contextual conception of knowledge and learning. The distance between the current and potential stages of psychic development is what Vygotsky, cited in Nardo (2021) referred to as the "region of close development". In other words, this is the difference between what a person can learn on their own and one that can do it with guidance in terms of education. Finding the best tools to bridge the gap is one of the difficulties facing modern teaching methodologies.

According to proposals from a constructivist perspective, the significance of the information provided to the learner, or the connection between the new information and their prior experiences so that the new knowledge makes sense, is the main tool for bridging this gap (Schmid *et al.*, 2022; García Gajardo *et al.*, 2015). To make this connection, it is necessary to understand the cultural codes of the students (Díaz and Hernández, 1999). The earlier is founded on the idea of "meaningful learning" created by cognitive psychology, particularly Ausubel, and cited in Tian *et al.* (2020). A potentially significant material that respects the prior knowledge of the learner, includes both theoretical knowledge and those related to its experience, avoiding transgressions. It does not allow the understanding of making this knowledge accessible and not trivial (Díaz Obando *et al.*, 2012).

In this sense, the professor serves as a mediator, helping students develop the ability to make connections between their prior knowledge and new information (Pinto Ladino *et al.*, 2019; Erbil, 2020). Similarly, providing tools to enable the application of this knowledge in new

contexts demonstrates its complete handling (Fernando and Marikar, 2017; Araya-Crisóstomo and Urrutia, 2022).

In a similar vein, "recontextualization" and the sociocultural context in general frequently have detrimental effects on learning. It has been demonstrated quantitatively that there is a connection between contextual knowledge and decodification abilities. Examples include the following: 1) with the help of contextual information, the adult readers were able to comprehend the unfamiliar words (Or-Kan, 2017); 2) non-native English speakers need individual consultations from advisers to improve their writing skills, whereas native English speakers do not (Woodward-Kron, 2007); 3) belonging to a different social or cultural condition, in this case a different religion, has a negative impact on the acquisition of new concepts (Addai-Mununkum, 2019).

When choosing how to implement education, other experiences demonstrate the value of using research on the cultural background of students as a point of departure (Freeborn *et al.*, 2023). In the same manner, scientific articles explaining a methodological approach for a mini-ethnographic analysis, specifically how to explore participant's feelings, beliefs and meaningful relationships between them as they interact with their culture, were considered as inputs of surveys done for the purpose of this research (Schwartz and Minkov, 2023; Fusch *et al.*, 2017). It was also very helpful to understand how culture could be understood as a tool in education and not only as academic information to know that cultural repertoires help early junior researchers to deal with the sometimes-competing career pressures (Steffy and Langfeldt, 2022).

The current study is situated as an heir to constructivism, using this viewpoint to suggest and assess teaching/learning strategies, particularly in the field of architecture. Although this field has its own difficulties, it is essential to connect technical knowledge with real-world experiences, encourage peer and self-directed learning, and acknowledge multiple intelligences.

1.3. Teaching architecture from the experience

Many architecture schools have taken on the challenge of changing their *curriculum* in recent years by looking for techniques and instructional strategies that enable the development of an academic innovation. In this manner, they concentrate on particular disciplinary resources that can serve as educational opportunities. It can be seen in searches of various initiatives, such as those examined by Pons-Valladares *et al*. (2022), where numerous international academic experiences are presented. Those initiatives aim to find novel approaches to bridge the gap between the current educational paradigm and contemporary social, cultural, technological, and environmental contexts.

The "design build" methodology proposed that students have a more active role in the design and construction processes in a simultaneous manner (Canizaro, 2012; Arias, 2021). This methodology has some experiences in relation to the previous strategies presented. The results of processes for building prototypes at various scales, like those used by Fab Labs and Makerspaces, are highlighted in the same way. There is a connection between such empirical experience and the use of materials, systems, and theoretical-conceptual knowledge regarding space (Soomro *et al.*, 2022).

However, these experiences are not always based on students' prior learning, and this approach cannot be used in all areas of the discipline. For this reason, this research requires extensive research on teaching/learning based on experience in addition to presenting a methodology that incorporates social constructivism in education. At the same time, it enables the entire student body to recognize their differences while engaging in "meaningful learning".

2. Methods

Given that the current work combines the evaluation of a design methodology for this specific case study, it is important to distinguish between two methodological concepts: a) the process by which this innovative methodology was developed with a mix focus, and b) the quantitative evaluation of results of this innovation, which is the primary focus of this paper. In the following, we will explain in detail both processes.

2.1. Case study

Alumni from the UTEM's School of Architecture in Santiago, Chile, tend to come from economically and sociocultural weaker areas. The following statistics pertain to the students who entered in 2019: 1) 58% received government subsidies; 2) 60% are from the three first fifth parts (rent is less than 192 USD per month per capita); 3) 69% are from undergraduate institutions with a high level of vulnerability; and 4) 79% are the first generation of students in their families to pursue higher education. In the same way, from an academic point of view the average grade at the PSU in 2022 was 491 out of 850. Furthermore, because the current architecture *curriculum* consists of six years of study, Table 1 displays the number of students who began in 2014 and 2015 as well as the graduation rate of students who took into account the two research years, 2020 and 2021. We observe a very low graduating rate going from 8% to 21%.

In addition, multiple Chilean rankings place the UTEM School of Architecture as the top architecture school in Chile, citing employment rates of 74,1% of graduates and average salaries between 1.500.000 and 1.600.000 at four years after graduation (three times the minimum wage).

It is important to note that Chilean architecture schools follow a *curriculum* that is very comparable to other universities both domestically and abroad. However, there are significant differences between universities in the type of students who enroll. Generally speaking, a student's skill level depends on the socioeconomic situation of their family, which later affects their grade at PSU. Additionally, the sociocultural environment within the university itself is homogeneous (Brito Rodríguez, 2018).

Because of all the issues raised previously, a test is conducted prior to the start of any career-related classes at UTEM in order to diagnose the level of the students' prior skills. Only 21% and 16% of the 130 architecture students who took the test in 2020 had the necessary language and math skills, respectively. Due to this, 80% of students in 2020 will not have fully developed skills in linguistic intelligence (such as the use of rhetoric, mnemonics, explanation, or metalanguage), nor will they have fully developed skills in logical-mathematical intelligence (such as reasoning, categorization, classification, deduction, generalization, calculation, and hypothesis and proof).

As part of the reconstruction of the *curriculum*, during last years, there has been changes to different *syllabus* and skills that should be reach on each subject. Implementing active learning strategies that consider students' prior knowledge is how it can be done. Examples include promoting peer discussion, running workshops or labs, using inductive reasoning, etc. Similar to how difficulties were previously demonstrated, numerous teaching/learning strategies have been investigated over the years, with some of them focusing on this type of active strategies that have shown promising results for the academic years of 2020, and 2021 (Caicedo-Llano *et al.*, 2023). The methodology described and assessed in this paper was built on these suggestions and experiences.

Four of the seven lines of the *curriculum*, namely Construction II, Territory and Urbanism II, Environmental Systems and Habitability II, and Architectural Expression II were used as samples in this research. According to Fig. 1, each subject is a part of the *curriculum*'s first cycle. Additionally, there is a higher rate of desertion during this time. Also, all subjects integrate theory and practice, which is regarded as one of the discipline's challenges. Because traditional intelligences like logic and mathematics are required, the Line of Structures (Estructura in Spanish) is excluded, as shown in Fig. 1. Similarly, the Workshops (Taller de arquitectura in Spanish) Line is not included, as shown in Fig. 1. This is because there is a mandatory individual evaluation methodology that requires an integration of the concepts learned in the other Lines.

2.2. Innovative methodology

The design of the methodology "meaningful learning from the sociocultural context" was developed through a mix methodology. On one hand, the main qualitative procedure corresponds to surveys of students in different steps of each subject. On the other hand, quantitatives procedures correspond to test of concept (or development test). Researchers and other coordinators of Lines of the *curriculum* formed a panel of experts (hereinafter the Panel). The panel revised the quantitative and qualitative findings to draw cross-disciplinary conclusions. On this page, step-by-step instructions will be provided.

The use of two tools was taken into consideration in Step 1, which was titled "Recognition of aptitudes coming from sociocultural context". First, the preliminary survey (qualitative), followed by the preliminary concept test (quantitative), both created by the Panel. Each Line coordinator presented a modification of the conventional methodology to the Panel in Step 2, which is the design of innovative methodology and is based on the output of the tools previously discussed. The third step, referred to as the innovation's implementation, involved selecting two sections for each subject, one experimental and the other control (which used the conventional approach). The level of motivation of each student was then determined through an intermediate survey. The qualitative assessment of the Panel in relation to the impact of the innovation on how learning outcomes might be met was taken into consideration in Step 4, which was referred to as the initial evaluation of innovation.

Fig. 2 displays a diagram that highlights the primary techniques applied in each of the earlier-mentioned steps.

Fig. 1. *Curriculum* of architecture showing Lines and Subjects where the methodology was applied. Own elaboration based on the *curriculum* of architecture.

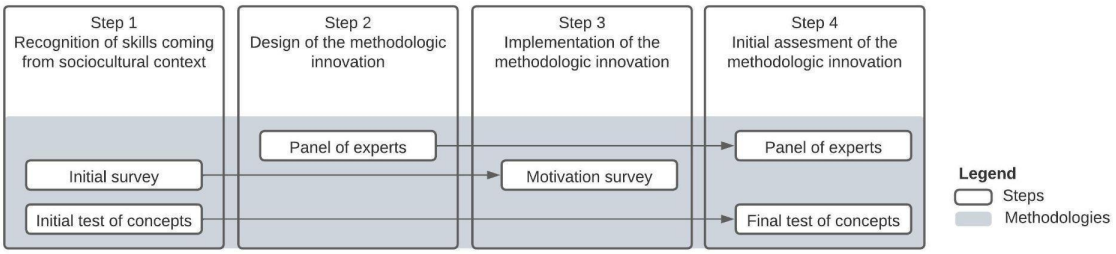

Fig. 2. Investigated steps for methodological innovation and the techniques used in each of them.

Table 1. Students enrolled in subjects considered in this research, and students enrolled in the professional career. Own elaboration.

Year	Students enrolled in the career	Year	Students enrolled (sample)	Students enrolled in the career (population)	Graduating students per year	Graduating rate per year (%)
2014	96	2020	39	141	19	20
2015	102	2021	101	138	21	21
Total			140	279		

2.2. Correlational assessment of results

The focus of the current paper is a process that evaluates the strength of the relationships between the two key quantitative variables comparing conventional instruction and the applied methodology. The first is academic performance at PSU, more specifically, performance on the Language and Math exams. Second, grades that were earned in experimental sections, specifically those that were earned on exercises where the traditional methodology was replaced with one that took sociocultural context into account. The following procedure was used to compare the data. On the one hand, PSU grades range from 150 to 850 points. On the other hand, at the School of Architecture, grades range from 1 to 7. We performed a correction based on the minimal grade, deducting 150 points from the PSU grades and 1 point from the test grades in the experimental section, respectively. After the correction, grades for the PSU and tests in the experimental section ranged from 0 to 700 points and from 0 to 6 points, respectively. Then, we applied the rule of three to the test grades in the experimental section to ensure that all grades had a 700-point base.

All data was gathered from a sample of 140 students, out of a total population of 249 students, as shown in Table 1.

3. Results and discussion

The results were presented in two groups based on the same difference that was highlighted in the methodological innovation section. We will first outline the Panel's key observations in relation to each stage of the methodological innovation's development. Second, results of the correlational evaluation will be shown allowing to evaluate the impact of the innovation.

3.1. General thoughts on the innovative methodology

It is significant to note that the initial survey has two main sections in relation to step 1. The first transversal component assessed a variety of interests, including, but not limited to, reading, writing, and photography. It demonstrated that, generally speaking, students do not have well-developed prior interests. This supported the initial theory that there had been very little development of their prior cultural background prior to the subjects of the career. The second section corresponds to the more detailed elements of each Line and identifies some pertinent variables for the subsequent actions. For instance, for the Construction II's Line to apply the innovative methodology, the student's family member works in construction, the student has experience working in related fields, or the student has completed prior technical coursework. The following factors were intended to define innovation in the Lines of Territory and Urbanism II and Environmental Systems and Habitability II: participation in communal affairs, holding representative positions, familiarity with a specific

software, agroecological knowledge, etc. However, they did not demonstrate enough variation between the students, necessitating the search for additional aptitude and knowledge markers.

The Panel discusses some innovative methodologies in Step 2 that demonstrate specific changes to each subject's *syllabus* while maintaining the subject's traditional organization and applying the innovation to a more significant assessment of the subject itself. For instance, using the outcomes of initial individual exercises in the subject of Territory and Urbanism II, allows to identify aptitudes appropriate to the situation and then apply the innovative methodology to a subsequent exercise in groups. In the case of Environmental Systems and Habitability II, the distinguishing factor was not prior knowledge but rather some students' lived experience in a rural area as opposed to the conventional urban experience.

In step 3, we established evaluation standards that professors teaching parallel sections could use to assign grades to exercises where the methodology had been used. This was one of the main challenges of the study that demonstrated the significance of the professor in the conventional teaching approach. For the purpose of comparing the application of the methodology, the Panel considered creating exercises in groups led by students whose contextual knowledge was relevant for the subject. This was the case with the topic of Construction II, where the leaders of each group of students were those with prior work experience or whose family members were construction workers or came from a background similar to that. Also, in Territory and Urbanism II, exceptional students led the groups during the first exercises, demonstrating prior knowledge of how to comprehend cities. Also, in the course Environmental Systems and Habitability II, professors chose students who currently reside in or have previously resided in rural areas to serve as leaders. A different approach was developed for the Architectural Expression II subject in which students were required to create a board with interests and recreational activities for everyone using their graphical skills.

Finally, in step 4, the key findings of the qualitative analysis of data gathered during the experimental phase, first reviewed by professors of each Line in a comparative manner, and then incorporated by the Panels, are as follows: 1) since the creative methodology relies on the students' in-depth understanding, the definition of variables may be complicated, allowing for the discovery of various contextual factors; 2) despite the inherent challenges of exploratory research, it is still possible to identify contextual factors influencing students' experiences; and 3) along with valuing experiences, it is also possible to value the design of subjects by understanding students' individual motivations.

To conclude, the design of these methodologies must have a significant capacity for flexibility as well as an ability to adapt to each group and each subject.

3.2. Assessment of the proposed methodology

Two sections make up the assessment of the proposed methodology. The average corrected grade for each subject is first compared to the PSU corrected grades, which consider the correction described in section 3.3. The corrected grades for each student at the PSU as well as the corrected grades for each student in the exercise where the methodology was used were then carefully revised for each subject. In

general, corrected grades at the experimental section are higher than at the control section, as shown in Fig. 3 and Table 2. The average corrected grade in the experimental section was only lower in the subject Environmental Systems and Habitability II when the methodology was used. We note that this methodology has a greater learning impact, and it is necessary to evaluate the reasons for variations in Environmental Systems and Habitability II in more detail. Territory and Urbanism II was the subject where the methodology had the greatest effect on students. Analyzing each case study subject allows us to observe results and assess various aspects of the methodology.

Fig. 3 shows the similarity between the PSU's average corrected grades in Math and Language. It appears that there is little difference between them, but this assessment will be reevaluated after a closer examination of the following graphics of student corrected grades broken down by subject. When grades are observed in a very specific way, we can draw conclusions that are not possible when looking only at overall averages.

The construction of Fig. 4, Fig. 5, Fig. 6, and Fig. 7 generally follows the same color-based criterion. The experimental section corrected grades are shown in green, and the PSU Math and Language corrected grades are shown in orange and blue, respectively. For the purpose of comparing corrected grades in the experimental section in relation with the dispersion of Math and Language corrected grades at PSU, we displayed a yellow band for a better visualization.

Now, in comparison to the PSU's fundamental knowledge, we can see in Fig. 5 for the subject Construction II that every single grade from the experimental section is higher than the PSU's grades. This occurs because it is possible to use prior knowledge to develop new subject-specific knowledge. In this sense, it is possible to draw the conclusion that applying the methodology to the exercise can, in most cases, close gaps that have already existed. This graphic also shows that PSU for Math corrected grades are typically lower than PSU for Language corrected grades. In other words, we can say that this section tends to have a more sophisticated "linguistic intelligence".

The biggest discrepancy can be found between Math corrected grades at PSU and corrected grades in experimental sections. This fact is crucial because, although the students' development in logical and mathematical intelligence is poor, it does not prevent them from succeeding in this subject. The exercise's design combines the student's abilities related to "body kinetic intelligence", which result from a very high level of development of the know-how to build. From there, they can devise a strategy for creating novel concepts in this subject.

When looking at the results in Fig. 5 for Architectural Expression II, it becomes clear that acquired Language and Math skills are generally not necessary to develop new knowledge in this area. It is primarily based on concepts related to the ability to visualize and graphically represent ideas from a "visual-spatial intelligence" field. This kind of intelligence also relates to the ability to comprehend space in three dimensions. We can see that there is the greatest dispersion of the Language corrected grades at PSU and the experimental section's corrected grades. Students struggle to articulate their ideas clearly in writing or orally, but they can do so through the use of illustrations.

When analyzing results showed in Fig. 6, the corrected grades at the experimental section of an Environmental Systems and Habitability II compared to corrected grades at the PSU for Math are almost parallel. In other words, there is a clear relationship between the intelligence required for this subject and the "logical-mathematical intelligence", even though the corrected grades of the subject exercise are always higher. In other words, we can say that "logic-mathematical intelligence" has a greater influence on how these subjects are learned.

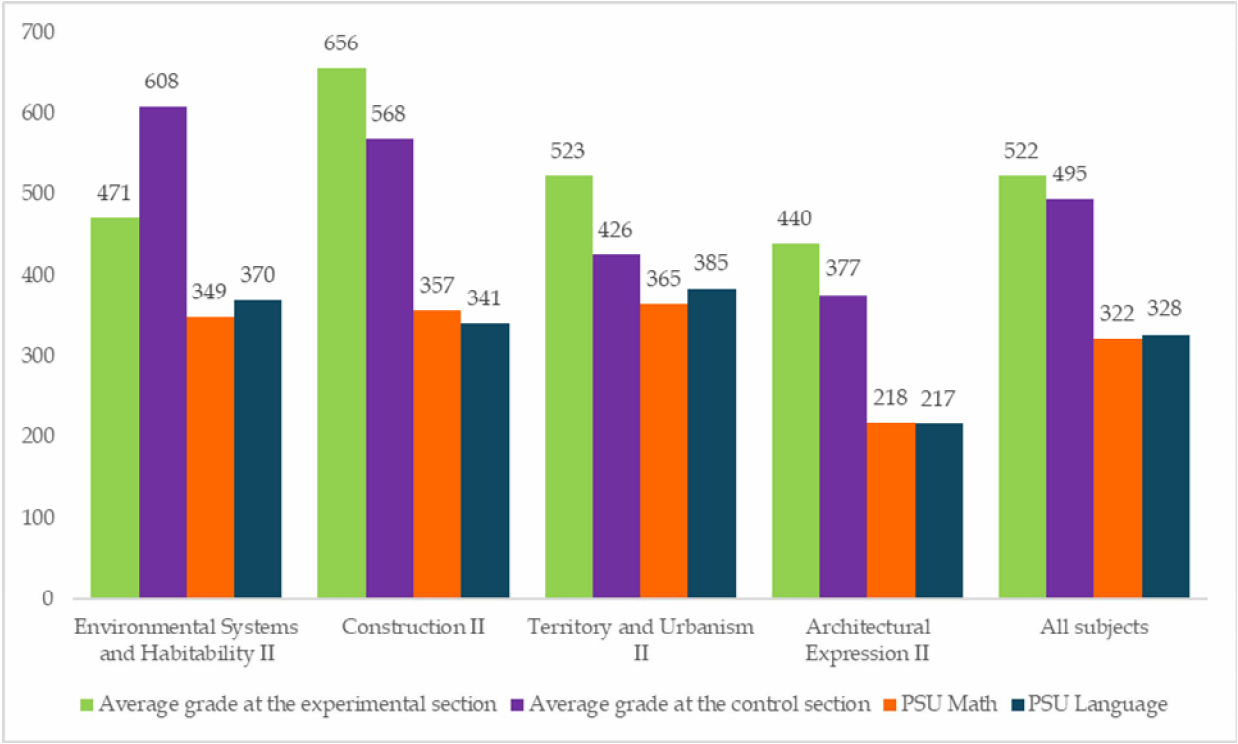

Fig. 3. Comparison of corrected average grades: (1) experimental section, (2) control section, (3) PSU of Math, (4) PSU of Language; Own elaboration on data of the Case Study.

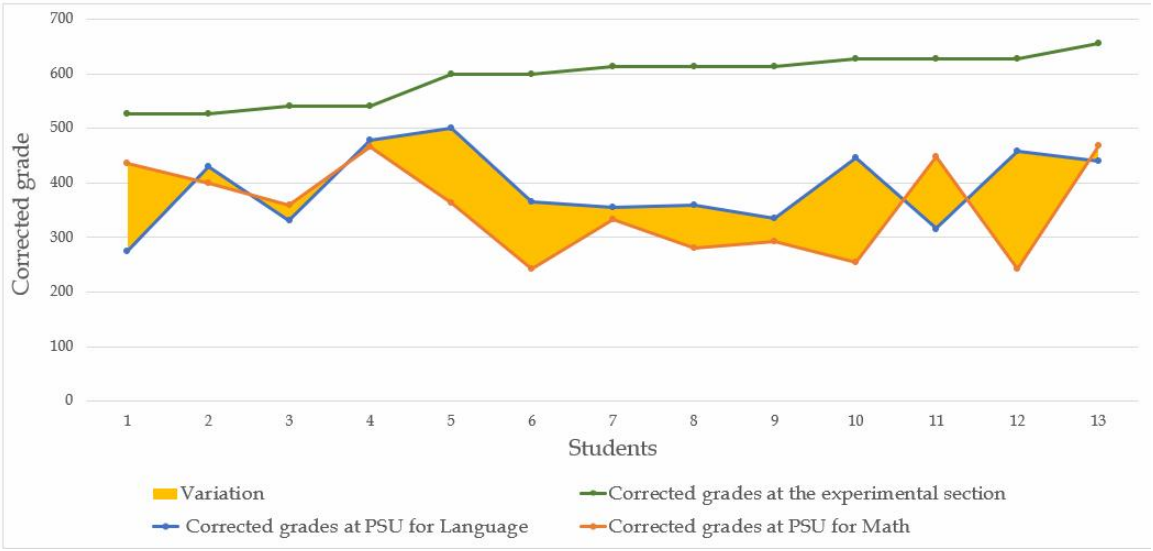

Fig. 4. Comparison between corrected grades in the experimental section in Construction II and grades at the PSU for Math and Language.Own elaboration on data of the Case Study.

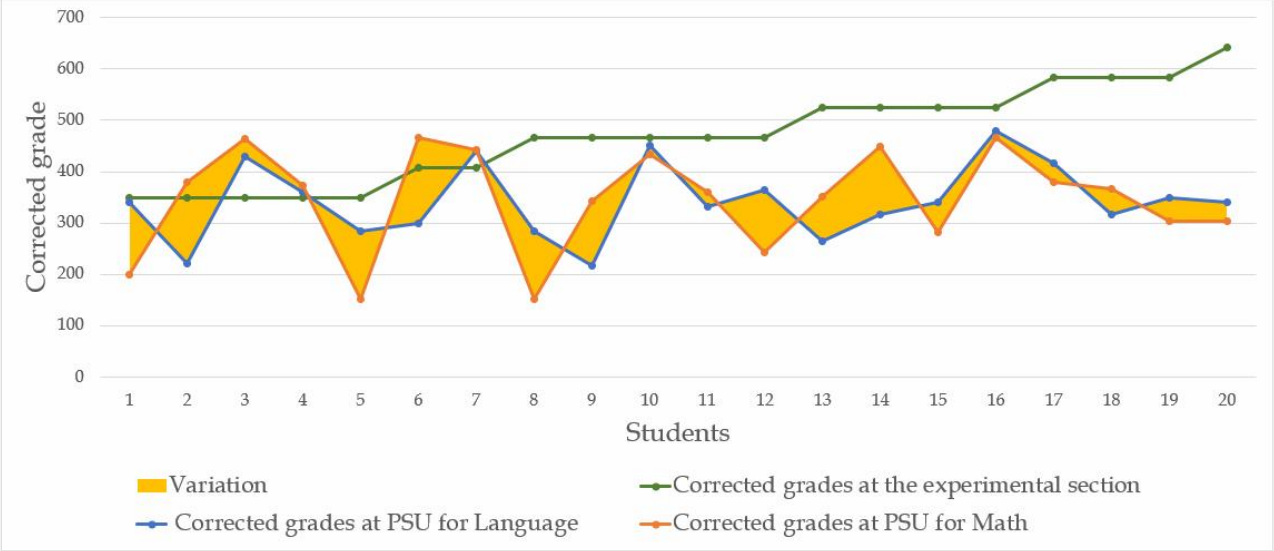

Fig. 5. Comparison between corrected grades in the experimental section in Architectural Expression II and grades at the PSU for Math and Language.Own elaboration on data of the Case Study.

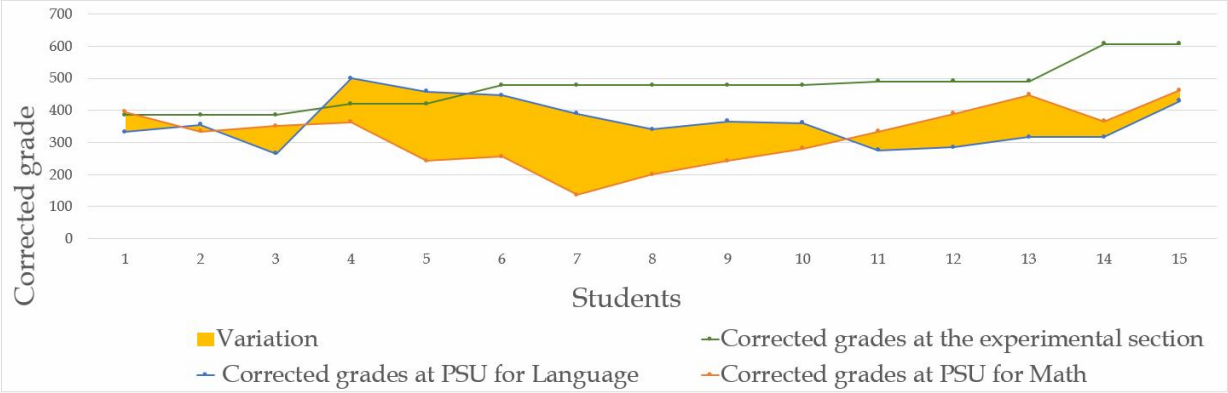

Fig. 6. Comparison between corrected grades in the experimental section in Environmental Systems and Habitability II and grades at the PSU for Math and Language. Own elaboration on data of the Case Study.

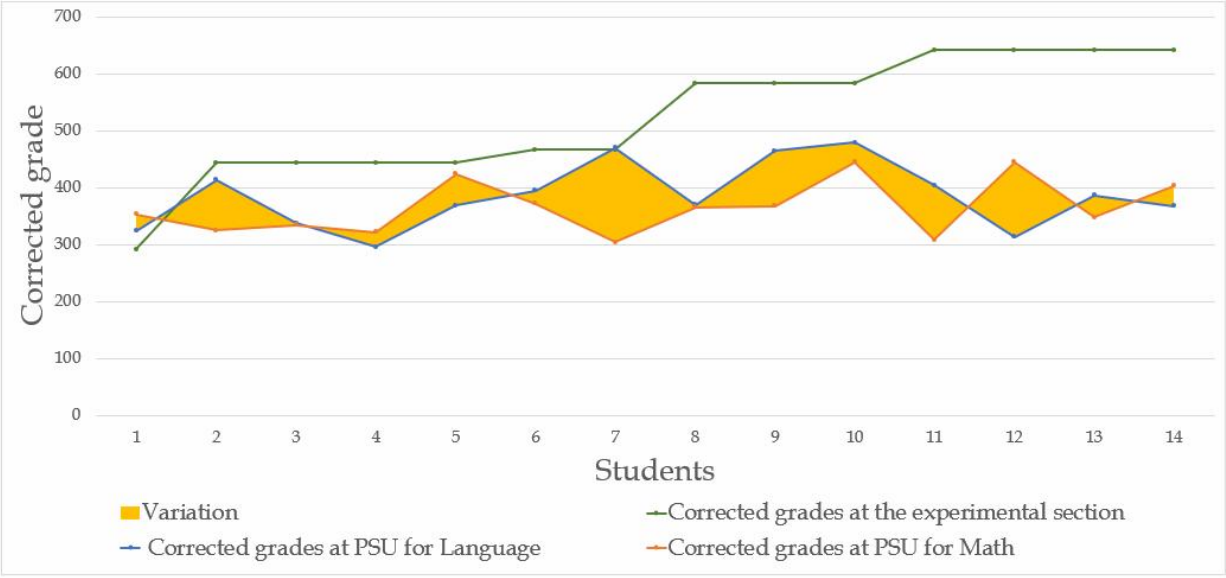

Fig. 7. Comparison between corrected grades in the experimental section in Territory and Urbanism II and grades at the PSU for Math and Language. Own elaboration on data of the Case Study.

Table 2. Comparison of corrected average grades of experimental section and control section. Own elaboration on data of the Case Study.

Subjects and type of section	Average grade	PSU Math	Average PSU Math per subject	PSU Language	Average PSU Language per subject
Environmental Systems and Habitability II Experimental section	471	320	349	362	370
Environmental Systems and Habitability II Control section	608	379		378	
Construction II Experimental section	593	353	299	392	316
Construction II Control section	568	245		241	
Territory and Urbanism II Experimental section	523	365	365	385	385
Territory and Urbanism II Control section	426	365		385	
Architectural Expression II Experimental section	413	222	218	220	217
Architectural Expression II Control section	377	214		214	

Additionally, the reason why this happens is because the skills acquired are more consistent with a "naturalistic intelligence". The exercise's suggestion is to concentrate on those who can design a suitable methodology by fusing their prior knowledge of nature and its surroundings.

The dispersion on all other subjects, except Territory and Urbanism II (small yellow band), is lower than Territory and Urbanism II, as shown in Fig. 7. This indicates that students tend to have an intelligence that is much more developed in either Language or Math, but not both. In addition, we can deduct from Fig. 8's results regarding Territory and Urbanism II that almost every student received better corrected grades at the experimental section than at PSU corrected grades. This may be the case because the complexity of the discipline and the skills required to master it stem from a variety of intelligences, including "naturalistic intelligence", "linguistic intelligence", and "visual-spatial intelligence".

As a result, the educational process is modified to help students build new concepts on their prior knowledge. It needs to consider various prior experiences, so a more comprehensive approach that accounts for all these variations is required.

It has been shown that there is a significant difference between the initial gap and the learning outcomes achieved during the subject of Construction II even though the results of the analysis subjects show that the methodology improves learning on every subject except Environmental Systems and Habitability II. That might be accounted for by the fact that building skills are fundamentally linked to "kinetic intelligence", and the methodology of learning was developed using construction experiences.

In the case of Territory and Urbanism II, a variety of skills that are involved in this

discipline make it simpler to choose significant experiences to build new knowledge with them. As a result, it is necessary to use a wider variety of strategies to achieve a deeper result. In the case of Architectural Expression II, students who have more developed "visual-spatial intelligence" may be able to learn skills developed in this Line more effectively.

Conclusions

Thus, it was confirmed that the social "recontextualization" of learning outlined in Vygotsky theories and cited in Guile (2019) enables students to grasp new concepts in a more effective manner. In the same way, it is shown that the theory of "meaningful learning" put forth by Ausubel and cited in Tian *et al*. (2020) could be attained through the personalization of instruction through experiences that bring together students' contexts in a new approach to learning that is tailored to the kinds of skills sought after to be acquired.

Although using quantitative methodologies in qualitative research is uncommon, three findings demonstrate that there are instances where qualitative data can be measured using quantitative methodologies, delivering less subjective aspects of the information collected (Or-Kan, 2017; Woodward-Kron, R. 2007; Addai-Munnunkum, 2019). Additionally, this research enables the use of the methodologies to be shown to have an impact. From the three papers previously mentioned, it is also possible to draw the conclusion that student exposure to the social and cultural environment is detrimental to their ability to learn. However, in this paper, the social and cultural context has a beneficial effect, adding more value to the research because of its uniqueness.

We chose to prioritize quantitative data over qualitative data in this study because the goal of this kind of research is to improve students' academic performance. In this regard, the research demonstrates that it is possible to find contextual knowledge in many Lines of the architectural career that enables the development of tools that recognize students' abilities on the one hand while concentrating on their weaknesses on the other hand.

Some variables that could affect the results should be minimized as much as possible or included in the systematization of the compiled data are the research's main limitations. One illustration of this is the fact that two sections of the same subject are taught by different professors, resulting in a variety of personalities and charismas. As a result, it may cause students to become more or less motivated. Similarly, outcomes in opposition to the hypothesis in the area of Environmental Systems and Habitability II may be linked to elements that are very challenging to regulate. Going deeper into the qualitative differences between this subject and the others should be interesting for this reason.

According to the general framework of this study, even though more disadvantaged students currently in Chile have access to a free higher education, they frequently have significant gaps in their foundational skills that make it difficult for them to remain in their current positions and find professional success. This research's main contribution in this regard is its potential to enhance students' learning opportunities. This could be done not only in other career-related subjects but

also in other academic fields. At the same time, we show how using students' prior experiences and prior skills helps them emotionally connect with newly learned concepts and facilitates the development of "meaningful learning".

The development of this study made it possible to realize that the results can be significantly improved when the characteristics of the students are identified in advance and a work methodology is used in the classroom. While the current study concentrated on non-traditional skills, future studies might use traditional skills alone or a combination of them. For instance, when planning the methodology to be used in the subjects, the PSU scores could be considered.

Looking at things differently and turning challenges into opportunities was the most crucial aspect of this work. It was also very beneficial to combine academic experts from very different fields to look for a methodology that would benefit students as a whole and not just those studying their specific fields. These results are a contribution to academic research because they inspire researchers to look for other novel working strategies to enhance the learning environment.

Acknowledgement

This article is the result of a project supported by the Competition for Research Regular Projects, VRAC code L217-18, Universidad Tecnológica Metropolitana.

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Received: 13 February 2024 • Revised: 17 April 2024 • Accepted: 29 April 2024