



## **The Impact Of The Regulatory And Financial Policies Of The Central Bank On Commercial Banks**

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**Abstract:** The Kingdom of Saudi Arabia has recently sought to activate the role of the Central Bank or the Monetary Agency in supervising commercial banks, in addition to trying to develop the various components of the banking system to the extent that qualifies them to achieve economic development. Based on this role, the main objective of this study is to try to identify the fundamental differences between each of the commercial banks and the Central Bank, and the various mechanisms and methods of banking supervision exercised by the Central Bank on commercial banks, and to evaluate their effectiveness and the reality of their application, especially with regard to prudential control, which is the most recent The most important method of banking supervision. And the extent of the central bank's understanding of the role that commercial banks can play in society if laws encouraging them are found. In achieving its objectives, the research depends on the descriptive analytical approach, and the use of the descriptive approach in exposure to general concepts, and the analytical approach through the analysis and diagnosis of some issues related to central and commercial banks. The research has reached many results, perhaps the most important of which is that the central bank represents a manifestation of economic sovereignty, and although central banks in the world differ in terms of form and functions from one country to another, they are characterized by some general features and characteristics that make them a central hub and leader of the monetary market and a supervisor and watchdog. It is organized as the issuing bank, the bank of banks, and the government bank. It undertakes the process of managing reserves and regulating credit. It uses a set of direct and indirect tools and means to perform its functions. There is also confusion between the nature and activity of the central bank with commercial banks. Which requires clarifying the lines between each of them. The study sample also agreed that there is an effective role for central banks in formulating monetary and supervisory policy for commercial banks. Commercial banks must also abide by the supervisory tools decided by the central banks. So achieve customer confidence, and check more warranty.

**key words:** Regulatory Policies; Financial Policies; The Central Bank; Commercial Banks; The Banking System; The Kingdom Of Saudi Arabia.

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## **Introduction**

Commercial banks represent one of the components of the banking system in the Kingdom of Saudi Arabia, and these banks have their own nature and characteristics, which require the central banks or the Monetary Agency to understand their nature when setting laws and instructions that govern work in them and control them. In order to take its role in the process of construction and social and economic development. In recent years, commercial banks have faced a set of crises that resulted in the liberalization of financial markets, which is known as the phenomenon of globalization and financial comprehensiveness. In order for every country to deal with the level of developments, it must practice monetary and financial policy to strengthen its banking system and keep pace with these new requirements. What distinguishes modern economies is the existence of effective supervisory systems on the banking field, as these systems work to achieve monetary balance within the economy, and perhaps the monetary authority represented in the central bank plays an effective and main role in bringing about this balance. In this regard, the Central Bank exercises a set of functions mainly related to commercial banks, and these functions are represented in the issuance of money; lending to commercial banks; Managing the borrowing process between banks, the most important of which is directing and implementing monetary policy through its supervision of commercial banks. The work of the Central Bank does not depend only on the issuance of money, especially following the growing trend towards the independence of central banks - and therefore, monitoring its ability to pump and absorb liquidity is ignoring the size and importance of its other functions, and the danger that could be caused by poor performance and management, and the absence of effective and strict control of banks' tasks. The function of the Central Bank in supervising commercial banks is one of the most important and recent functions entrusted to it, as commercial banks are a means to meet financing needs by receiving deposits and providing loans to their applicants. Failure to provide adequate protection to depositors. On the other hand, the occurrence and wide spread of banking crises, such as those that occurred in Southeast Asian countries, poses the problem of how to avoid and treat them, especially as it is the biggest problem that the economy can know. Banking supervision is no longer confined to monitoring the degree of banks' liquidity only, but is more and more concerned with the quality of the obligations taken by these banks and their reflection on the solvency of the latter. The role of the central bank as an observer dictates that its regulation be tight, through efficient management and advanced structures and means. In addition to the tight administrative and legal regulation of the Central Bank, finding successful methods and mechanisms to control the activity of commercial banks is of importance, as it was to ensure the protection of depositors and the stability of the banking system as a whole. The Kingdom has recently sought to activate the role of the Central Bank or the Monetary Agency in supervising commercial banks, in addition to trying to develop the various components of the banking system to the extent that qualifies them to achieve economic development. The research problem stems from the existing confusion between the role of each of the commercial banks on the one hand and the central bank on the other. And the mechanism by which the Central Bank or the Monetary Agency deals with commercial banks. The main objective of this study is to try to identify the fundamental differences between each of the commercial banks and the Central Bank, and the various mechanisms and methods of banking supervision exercised

by the Central Bank on commercial banks, and to evaluate their effectiveness and the reality of their application, especially with regard to prudential control, which is the latest and most important method of banking supervision. . And the extent of the central bank's understanding of the role that commercial banks can play in society if laws encouraging them are found.

### **The supervisory role of the central bank over commercial banks**

Central banks exercise major types of control over the credit activity of commercial banks, and from each type a huge number of methods and policies are branched, depending on the extent to which the central bank needs them on the one hand, and the different economic structure that operates in response to emergency circumstances. And quantitative control methods focus the work of quantitative tools or means of quantitative control to influence the credit provided by banks, regardless of its uses (Badis, 2012). A group of these quantitative means is the discount rate policy, the open market policy (Buitter, 2008), and the change in the legal reserve ratio. Re-discount rate policy The re-discount rate is the interest rate charged by the Central Bank in exchange for providing the necessary cash liquidity to banks, either through direct lending or through re-discount or purchase of commercial papers offered by banks (Mohammed, 2018). There is a relationship between the rediscounting rate and interest rates, whereby an increase in the rediscounting rates leads to a decrease in the volume of money, which leads to higher interest rates in the financial markets, and from it discourages borrowing from commercial banks, and consequently a decrease in credit. This rate is reduced when the volume of credit is increased. (Anas, 2018).

### **Central Bank Tools for Supervising Commercial Banks**

The effect of the discount rate: The determination of the discount rate is related to the conditions of the loan market, as reducing the discount rate to affect the volume of loans or credit provided by commercial banks to their customers, and when you want to restrict either for lending banks, when the central bank raises the rediscount rate, commercial banks resort to raising its discount rate for securities, and also raises the interest rate on its loans granted, which results in a decrease in the demand for loans from its customers because the cost of borrowing becomes high, and consequently the volume of loans granted by commercial banks shrinks and thus affects the size of the money supply, and that the high discount rate will lead to Encouraging owners of savings to increase their various deposits with commercial banks in order to obtain a high interest rate (Midhat, 2001).

Open market policy: The open market policy means that the Central Bank carries out the sale and purchase of securities and commercial transactions in the financial markets, for institutions and investment projects, but the volume of credit provided by commercial banks is subject to the control of central banks, which do not allow the volume of credit to exceed the level of natural economic stability. The impact of the open market policy This policy has a direct impact on the amount of cash reserves, and therefore you can carry out lending operations, which leads to a decrease in the interest rate due to the increase in demand for securities, and the increase in the money supply causes a decrease in the interest rate, which raises the volume of investment, income and employment, This is when the bank follows an expansionary monetary policy to get out of the recession (Mati, 2009), but in the case of inflation, the central bank will work to limit credit, and absorb the excess money supply by following a contractionary monetary policy. Commercial banks pay their price in cash, and commercial banks have cash reserves, so income and employment decrease, bond prices decrease, and the interest rate rises. As for the policy of adjusting the legal

reserve ratio (Abdul Muttalib, 2001), it considers reserves as a tool of the central bank to compel commercial banks to leave a certain percentage of their deposits in a credit account with the central bank, that is, to freeze part of their resources and place them with the central bank. The amount of credit offered by commercial banks (Al-Taher, 2003).

### **Methods of qualitative or qualitative control of the central bank on commercial banks**

The use of qualitative control methods began in England since 1924, although the capitalist countries did not give any attention to qualitative control methods, and this is due to the fact that the interest of these countries is limited to monetary stability, which made them focus on using quantitative control methods to treat cases of inflation, and the success of using qualitative control methods depends on the extent of the borrowers' commitment to use the loans in the activities in which the borrowers contracted with the banks upon requesting the loan (Al-Taher, 2003). The central bank uses quantitative tools to control credit, but these tools may not be able to influence commercial banks, especially if they are branches of foreign banks. These tools (Badis, 2012).

**Direct supervision:** The Central Bank relies on this type of supervision in strengthening the quantitative and qualitative control over credit, and it is used as an alternative to them in regulating the credit activities of commercial banks. Whereas, quantitative and qualitative methods are not effective in confronting the situations that affect the national economy and call for a quick solution. The Central Bank applies the third type of supervision, which is direct supervision (Buiter, 2008).

**Control:** The orders and instructions issued by the Central Bank to all commercial banks, and related to the maximum limits for loans and investments, as well as the policies that the commercial banks have to abide by in the field of lending and investment.

Accordingly, in applying this method, the Central Bank relies on the legislation that defines the relationship between it and the commercial banks and the measures it is entitled to take to ensure the enforcement of its instructions (Abdul Muttalib, 2001). As well as the strong financial position that the Central Bank enjoys as a result of being the issuing bank, which makes commercial banks seek to improve their relationship with it to ensure that they obtain loans in times of crisis. In implementing this policy, the Central Bank relies on two methods. First, the method of moral persuasion. A literary position as a result of the role it plays in serving the national economy and is considered feasible in countries where the central bank has exercised its responsibilities for a long time. As for countries that are new to central banks or where the central bank engages in normal banking business alongside its work as a central bank, the method of persuasion may be useful. Limited, forcing the Central Bank to use the method of orders and binding instructions. Secondly, direct instructions and orders. According to this method, the Central Bank issues decisions to commercial banks in line with the requirements of monetary management that aim to achieve monetary political purposes, for example, that the Central Bank sets the maximum limit for the total number of commercial bank loans for small industries (Hussain, 2011), in order to be able to increase their production. There is no doubt about the success of this method, especially since the Central Bank may resort to imposing sanctions on banks that follow the Central Bank's credit policy for the violating policies, and that it is necessary to coordinate between different economic policies, especially fiscal policy and monetary policy, so as not to conflict with the policies

followed, and the result is the failure of these policies to achieve their goals. Fiscal policy tends to increase the volume of government spending at the same time (Mati, 2009).

**The Central Bank and its Relationship with Commercial Banks:** The Central Bank is the institution that occupies a major place in the money market, as it stands at the top of the banking system and is concerned with matters of credit and banking policy in the country, and supervises its implementation. In view of the great similarity in the functions performed by central banks under the various monetary and banking systems, a set of rules and foundations have emerged that work to regulate the work of central banks, but the general framework in which these banks exercise their functions differs from one country to another, according to the composition The prevailing credit structure, the amount of available financial resources (Badis, 2012), the extent of the money and money markets, the degree of banking awareness, and in general the degree of economic growth and the type of monetary system in which the central bank performs its various functions (Midhat, 2001).

The functions of the central bank in supervising commercial banks and regulating credit is the main function, as this oversight is carried out through the relationship that links the central bank with commercial banks as the bank of banks and the last lender, and the state bank represents an increase in being the issuer of banknotes.

#### **Distinguished by the Central Bank in supervising commercial banks:**

The Central Bank is characterized by the issuance of legal money (Ali, 2012): The importance of the issuance function, in addition to being represented in controlling the volume of legal money in circulation (or the largest part of it), is related to the importance of the volume of legal money in circulation (or the largest part of it). This money depends on the ability of commercial banks to create deposit money, as the latter's ability to grant credit is related to their liquid balances and the volume of deposits (Abdul Muttalib, 2001). The central bank is also the state bank: the central bank is the main tool in the government's hands to implement its monetary policy, as it maintains its accounts and provides it with the short and long-term loans it needs. The consumption of public debt and the payment of interests, and the Central Bank is considered as a monetary advisor to the state with regard to the policies to be followed to meet various circumstances. The central bank is also the bank of banks, where commercial banks maintain with the central bank a certain percentage of their cash balances, and this makes it easier for them to conduct the clearing process between the rights and debts of these banks. The Central Bank also undertakes the process of lending to commercial banks, where it is always ready to assist them in the event of a financial deficit or when necessary, and for this reason the Central Bank is the last lender to the credit system. It is possible to distinguish between ordinary credit operations and exceptional credit operations. Ordinary either takes the form of discounting, re-discounting, or loans with guarantees, or the exceptional, which means that the central bank grants credit to commercial banks in times of financial crises within conditions that it determines (Anas, 2010). In addition to credit control, this function is considered one of the most important functions of the central bank, as it represents the main tool on which it depends in the implementation of monetary policy. The legal requirements for the compulsory reserve, including the method, represented in the framing of loans, the required guarantee margin, the maximum interest rate, and control over the mortgage terms (Badis, 2012).

#### **The independence of the central bank and its relationship with commercial banks**

The independence of the Central Bank is one of the most important debates in the current era in the banking arena, as this independence would increase the credibility of central banks and the effectiveness of monetary policy. It has been observed during the past two decades that the trend towards the independence of the Central Bank has grown on both the theoretical and practical levels, especially after the International Monetary Fund officially adopted it in its recommendations for financial and banking reform (Al-Taher, 2003). This independence is the basic condition for the central bank's ability to set and implement monetary policy objectives, in order to ensure the achievement of its main objective of achieving price stability and preserving the value of the currency. The independence of the Central Bank is meant to give it complete independence in managing monetary policy, by isolating it from any political practices by the executive authority on the one hand, and giving it complete freedom of action in setting and implementing monetary policy, and vice versa if those objectives are precisely defined. Also, the central bank is considered independent if it is free to set and implement the appropriate monetary policy to achieve its objectives, and is not considered independent if it is bound by a specific monetary base or to finance the budget deficit, for example. However, granting the Central Bank its independence does not mean that it is not responsible towards any party, and this requires at least the need for it to explain and justify its actions and policies, through publications and reports in the face of public opinion or in the face of parliamentary institutions by appearing before their specialized committees (Hussein, 2011).

One of the most important criteria for the independence of the Central Bank is the extent of the Central Bank's commitment to financing the deficit in government spending and granting credit facilities to the government. And the extent of the freedom and authority of the Central Bank in setting and implementing monetary policy, and the limits of the executive authority's intervention in that. And the importance of the goal of maintaining price stability and the value of the currency in relation to the rest of the other goals. The extent of the government's authority to appoint and dismiss the governor of the central bank and members of the board of directors, and its authority with regard to the bank's budget. And the extent to which the central bank is subject to accountability (Midhat, 2001). The most important reasons for calling for the independence of central banks revolve around three main points, which are the outcome of theoretical studies that proved the inflationary bias of the absolute freedom of governments in setting monetary policy. The outcome of applied studies regarding the relationship between the independence of central banks and low inflation rates, is the link between the independence of the central bank and price stability as the main objective of monetary policy. It should be noted here that the independence of the Central Bank is not determined only by what is stipulated in the relevant legislative texts, it is also linked to other factors, including the multiplicity of objectives, the human capabilities working in the Central Bank, the traditions that govern the working relations between the monetary authority and the government, and the personal qualities of senior officials in the bank. The central bank, in addition to the extension of the authority of the central bank to include the exchange rate policy, due to the strong correlation of the effectiveness of monetary policy with the exchange rate policy. In practice, by following up on the independence of central banks, it becomes clear that there is no absolute independence from the government, but rather there is a certain limit for the government to impose its authority directly or indirectly, regardless of the degree of independence. In addition to the existence of several obstacles that affect the effectiveness of legal independence in reality, and these factors often gather in developing countries, and differ from one country to another, such

as the nature of inflation, its causes and development, the level of culture in society, the extent of the existence of a broad and effective developed market (Abdul Muttalib, 2001).

### **Direct Quantitative Controls**

As the central bank can, by means of these tools, determine the higher volume of credit and loans granted by commercial banks during a certain period of time, which qualifies it to control the volume of total flows and balance them with the requirements of the internal economic movement in order to stabilize the movement of stability and balance in the national economy and the most important of these tools (Badis, 2012), charging selective rediscount rates. and selective requirements for the legal cash reserve of commercial banks. and setting selective upper limits on monetary investment to compel banks to extend credit to certain sectors. And set interest rates on some types of loans, in order to encourage a specific type of loan. Pre-approval of some types and amounts of loans, especially long-term loans. And the imposition of selective exemptions from the severe restrictions of the general credit control (Anas, 2010).

### **Complementary quality controls to conventional monetary policy**

Direct qualitative control deals with the intervention of the Central Bank in clarifying the conditions and modalities of using credit, i.e. showing how commercial banks must grant credit according to the specific aspects, and these means can be summarized as follows. Required guarantee margins  
The policy of direct control of the Central Bank requires a change in the required guarantee margins on loans granted for speculation in the stock market. The Central Bank uses this direct control by raising or lowering those guarantee margins according to the situation of inflation. The interpretation of this is that speculative individuals should pay a part of their purchases of securities from their own money and the other part by borrowing from commercial banks. In times of inflation, the margin that speculative individuals must pay for the purchased securities increases. However, the effectiveness of this tool is limited, especially if there is no urgent need to request credit from banks, and this is often available in the case of the availability of cash reserves in the hands of individuals, as it enables them to purchase all securities, and speculate on them without the need to request credit from banks. Monitoring consumer credit (sales in installments) and this means monitoring consumer insurance operations, i.e. terms of sales in installments, in order to ensure the control of public cash spending rates, i.e. by facilitating terms of sales in installments in times of depression and restrictions from us in times of inflation, given the harmful effects of the increase in the rate of consumption At a time when there is an urgent need to reduce it, such as during times of war. Real estate credit control: It is intended to influence the amount of credit granted for the purposes of real estate financing by constructing buildings and purchasing land and other real estate facilities, in order to achieve the requirements of development and the interest of the national economy, such as restricting housing facilities in favor of industrial facilities, or achieving a balance between real estate financing and financing other projects that require them. movement of economic activity. This is in order to reduce the volume of cash flows that stimulate inflationary phenomena (Hussain, 2011). Interbank clearing policy: The Central Bank has direct control over credit through the settlement of debit and credit accounts, which is carried out under its supervision in the clearing house, which leads to greater knowledge of the credit policies and monetary conditions of commercial banks, which facilitates the Central Bank to advise and issue

instructions related to credit operations. Or a shortage, depending on the conditions of economic activity (Al Bakri, 2010).

### **Alternative monetary policy tools**

Monetary authorities may use means and tools that are in themselves different from other monetary policy tools, but they are mostly used as a complement to monetary policy and in emergency circumstances, often physical control of credit. And control the algebraic pricing and influence it. and use the cards. And the use of special licenses to obtain raw materials. Determining the quotas or diversification of imports. and exchange control.

### **Criticism of the effectiveness of selective qualitative monetary policy**

Some economists see that the selective and qualitative means of monetary policy have a limited and partial impact on investment and consumer spending because it can be avoided and because it is short-term, in addition to having a greater impact and benefit as an expansionary monetary policy, by allowing a certain type of desired spending, which may be an amplification, which reduces the effectiveness and efficiency Credit Constraints (Al-Taher, 2003).

Cairncross believes that selective qualitative methods are not a substitute for general quantitative methods to limit the expansion of credit and control inflation, and may be ineffective sometimes. Directly, as well as by influencing the size and direction of inflationary financing, and there is no hesitation in saying that this policy can be a strong bond and a source of assistance for indirect quantitative means in achieving economic stability, controlling inflation, getting rid of its suspicious effects, and managing the inflationary monetary right according to patterns The planned and desired productive investment in the developing national economy (Badis, 2012).

Noting that developing economies are characterized by the presence of limited monetary, financial and banking institutions that constitute important obstacles that limit the effectiveness and efficiency of public quantitative means in injecting and controlling inflation and credit and directing production. From what can be said that the selective monetary policy, through its direct control over the important strategic sectors in the developing economy, can exert an effective qualitative and quantitative influence on the level of aggregate demand, and consequently it is necessary to achieve a monetary restriction or monetary payment according to the requirements of economic growth (Abdul Muttalib, 2001).

### **The function of the central bank is to control the bank credit of commercial banks**

It indicates the extent to which the banks are able to cover the loans. This important and large edifice in any country undertakes several tasks, including. Quantitative control methods aimed at influencing the amount of bank credit regardless of the object of use. Rediscount rate policy. The rediscount rate is the interest rate charged by the central bank in exchange for providing loans and advances to commercial banks. The central bank can influence the size of the cash reserves present with the banks, and consequently in their ability to create credit (Midhat, 2001).

If the central bank wants to reduce the volume of bank credit, it resorts to raising the re-discount rate, which means an increase in the interest rate at which commercial banks borrow by extension. Here, the banks are forced to raise the price at which they discount the commercial papers presented to them, as well as the interest rate they charge on the loans granted, which leads to a restriction of the volume of credit and vice versa. In conditions of undesirable inflation and economic expansion,



the Central Bank resorts to raising the rediscount rate, which leads to raising interest rates in commercial banks and raising the cost of borrowing, thus resulting in a contraction of credit movement and a decrease in investment and employment levels, and then a decrease in demand for goods and services and a decline in the inflationary trend until Demand balances with aggregate supply at worst (Ali, 2012).

In conditions of deflation and unemployment, the Central Bank resorts to reducing the re-discount rate to reduce loan interest, expand activity, increase production levels, employment and wages. These developments lead to an increase in demand for goods and services and break the efforts of the deflationary situation, so income levels and prices rise. For the effectiveness of the re-discount rate policy, it is required that the cost of borrowing is an influencing factor in investment and production decisions. And that the changes that occur in interest rates are to the degree that they have the desired effect on the volume of credit (Badis, 2012).

The absence of organized money markets outside the commercial banks, so that high interest rates lead to businessmen's shift away from these banks and towards alternative sources of financing, and that re-discount rates affect the profit expectations of regulators. Open market policy: It means the central bank buying and selling government securities of varying maturities in the stock market. It is one of the most important policies that central banks follow to influence the size of banks' cash reserves and then their ability to find credit (Midhat, 2001).

Therefore, open market operations affect the general investment climate, as the central bank's sale of government bonds results in a decrease in their prices, which means higher interest rates in light of the stability of bond returns, which constitute an important determinant of investment determinants. This selling policy also exerts a psychological impact on dealers because it Reflect the government's tendency to follow a strict policy in relation to the financial markets, which makes businessmen reluctance to expand investment or make new investments, and these developments lead to a decrease in the aggregate demand for goods and services and thus reduce inflationary trends. On the contrary, if the central bank buys some government bonds, their prices will rise, which means lower interest rates on them and interest rates in the market in general, which stimulates investment. There is also an optimistic tendency about the government's policy towards investment, which in turn leads to the expansion of investments and to an increase in production. And aggregate demand in the market and then out of the state of economic depression that the society may suffer. Accordingly, in times of inflation, the central bank resorts to selling government securities to reduce the cash balances available with banks and thus limit their ability to grant credit (Hussain, 2011).

### **The Required Conditions**

For the effectiveness of this policy, the central bank must have the appropriate amount of securities that enable it to have the desired effect in the credit market, and it also requires that the expectations of profits and optimism in the investment market not be to the degree that it weakens the impact of higher interest rates resulting from lower stock prices. In the event of a recession, the central bank resorts to buying securities and injecting a quantity of money with the aim of urging banks to expand credit in light of the abundance of cash reserves. Profitability, where businessmen do not accept to borrow from banks despite their ability to grant credit, and the low interest rate as a result of high stock prices, may not constitute a sufficient incentive to take a new investment in light of low levels of profitability, and therefore open market policy is usually few Feasibility in periods of

deflation, especially in the case of the weak ability of the central bank to bear financial losses resulting from the purchase of securities at high prices in times of economic downturn. Changing the reserve ratio is considered one of the most effective policies in influencing the volume of bank credit. In times of depression, the central bank resorts to reducing the reserve ratio, that is, the possibility of commercial banks using some of the cash balances that were present in their vaults with the central bank in granting more loans, which leads to an increase The size of the means of payment, the activation of transactions, the increase in aggregate demand, and then the levels of employment and national income (Al Bakri, 2010).

In times of inflation, the Central Bank resorts to raising the cash reserve ratio to limit the ability of commercial banks to find credit, as these banks are forced to reduce credit and increase their cash balance to meet the requirements of the Central Bank, which results in a decrease in aggregate demand for goods and services and thus lower price levels (Anas, 2010).

### **Qualitative or qualitative means**

These means aim to influence how credit is used and the different aspects it is directed to. The aim of qualitative control may be to direct a greater percentage of loans to areas of commodity production, especially export commodities, and to reduce non-productive credit that is directed to speculative purposes in the markets (Abdul Muttalib, 2001). One of the methods of qualitative control is to set different interest rates according to the type of loans. And distinguishing between loans by origin provided as collateral. Determining the maturity dates of the various loans according to the purposes of using the loan. Determining specific quotas for each type of loans, such as increasing loans directed to industry at the expense of loans directed to financing service activities (Ali, 2012). And the requirement to obtain the approval of the Central Bank for loans whose value exceeds a certain amount. Determining the operations that commercial banks are not allowed to engage in, or specifying a maximum limit for what they may acquire from certain assets. Direct control Central banks resort to direct explicit intervention in the banking market through the so-called direct control. This control takes one of two forms, a mitigating form represented in moral persuasion and a strict form represented in direct instructions and orders. The Central Bank relies on the method of moral persuasion by virtue of its position in The banking system and the role it plays in serving the national economy. This method takes the form of statements made by the Central Bank, general directions and advice directed to banks, in addition to the meetings it holds with bank representatives to exchange opinions on monetary and credit affairs. In the event that the moral persuasion method is ineffective, the central bank resorts to the method of binding orders and instructions, which may take the form of a maximum limit for loans granted by commercial banks, or obligating the bank to direct a certain part of its resources in the purchase of government bonds, treasury bills, or others. The Central Bank resorts to imposing penalties on the violating banks, such as depriving them of borrowing, charging them higher interest, or refraining from re-discounting the commercial papers submitted by them (Al-Taher, 2003).

### **Practical Application**

This part aims to present the results of using some descriptive statistical methods that were produced by the questionnaire, by analyzing the respondents' opinions on the role of central banks in drawing up the supervisory policy of commercial banks.

Statistical description of the demographic variables (personal) for the study sample: 74 questionnaires were distributed, and 8 questionnaires were excluded as a result of the insignificance of their results. 66 sample items were subjected to analysis, and the statistical analysis program SPSS was relied upon in the statistical analysis, and the table The following shows the frequency and relative distribution of the components of the sample: -

**Table No. (1): It shows the frequency and relative distribution of the components of the sample**

Gender		age					total
		less than 30	31-40	41-50	51-60	more than 60	
Male	Number	7	21	12	6	2	48
	%	14.6%	43.8%	25.0%	12.5%	4.2%	72.7%
Female	Number	4	8	3	2	1	18
	%	22.2%	44.4%	16.7%	11.1%	5.6%	27.3%
total		11	29	15th	8	3	66

Measuring stability, validity, and homogeneity of the total responses

**Table No. (2): Shows the values of validity and reliability coefficients for the questionnaire axes**

Element	N of Items	Cronbach's Alpha	Credibility
Total survey	12	0.970	0.985
first axis	3	0.883	0.940
second axis	3	0.863	0.929
third axis	3	0.782	0.884
fourth Axis	3	0.823	0.912

The reliability coefficient (Cronbach's alpha) was calculated after deleting any of the items and paragraphs for each of the questionnaire axes, and this did not lead to an increase in the overall reliability coefficient, as it is clear from the previous table that the value of the reliability coefficient (Cronbach's alpha) is very high for the total of the questionnaire and the axes. Which reflects the significance of the results that can be reached by analyzing the questionnaire items, and that the study tool is characterized by high stability. These results also indicate that the study tool has great stability, which makes us fully confident in the validity of the questionnaire and its validity to analyze and interpret the results.

Weighted average and trend of sub-items and measures of total responses

**Table No. (3): The relative importance of the first axis paragraphs**

M	Questions	weighted average	standard deviation	Direction
	The nature and activity of the central bank does not differ with commercial banks			

1	<b>I feel that there is a great similarity between the role of the central bank and commercial banks</b>	3.80	1.33	Agree
2	<b>Central bankers do not feel that there is much difference with commercial banks</b>	4.27	1.05	Strongly Agree
3	<b>The nature of central banks is similar to that of commercial banks</b>	4.49	1.45	Strongly Agree
<b>There is an active role for central banks in formulating monetary and supervisory policy for commercial banks</b>				
1	<b>The central bank is an effective tool in formulating monetary policy for commercial banks</b>	4.14	1.38	Agree
2	<b>The central bank is an effective tool in drawing supervision for commercial banks</b>	4.08	1.17	Agree
3	<b>Commercial banks comply with the decisions of the Central Bank</b>	3.96	0.59	Agree
<b>Commercial banks abide by the supervisory tools decided by the central banks</b>				
1	<b>I see that commercial banks are sufficiently committed to what the Central Bank decides</b>	3.90	1.44	OK
2	<b>Represents the commitment of commercial banks to the control tools imposed by the central banks, which represent an effective tool for customer support</b>	4.24	1.12	Strongly Agree
3	<b>Supervision of commercial banks is only one of the tools of central banks</b>	3.63	1.47	Agree
<b>There is sufficient awareness among those who draw up monetary policies at the Central Bank to take decisions regarding the business of commercial banks</b>				
1	<b>Those in charge of banking policy are sufficiently aware of the control tools of commercial banks</b>	3.66	0.74	Agree
2	<b>Central banks represent the most important areas of internal and external control over banks</b>	3.70	1.08	Agree
3	<b>Central bank employees are sufficiently aware of the requirements of effective regulatory policies</b>	4.14	0.66	Agree

It is clear from the previous table that the general trend of responses to the total of the first axis, which is related to the axis, was "agree", with an average of 3.98, while the trends of the sample's responses towards the axis of the nature and activity of the central bank with commercial banks was "agree to severity", with an average of 4.49. As for the respondents' attitudes towards the paragraphs of the second axis, an effective role of central banks in drawing up the monetary and supervisory policy of commercial banks, it was in agreement with an average of 3.96. While the

third sub-axis, which reflects the commitment of commercial banks to the control tools decided by the central banks, the respondents' attitudes were "agree", with an average of 3.63. While the trends of the sample's responses towards the fourth sub-axis "there is sufficient awareness among those who draw up monetary policies at the Central Bank to take decisions regarding the business of commercial banks is "agree", with an average of 3.53

The relative importance of the axes

**Table No. (4): The relative importance of the paragraphs of the axes**

Sub items	the scale	weighted average	%	direction
The nature and activity of the central bank does not differ with commercial banks	I feel that there is a great similarity between the role of the central bank and commercial banks	4.04	80.84%	Agree
	Central bankers do not feel that there is much difference with commercial banks	4.16	83.28%	Agree
	The nature of central banks is similar to that of commercial banks	4.28	85.68%	Strongly Agree
There is an active role for central banks in formulating monetary and supervisory policy for commercial banks	The central bank is an effective tool in formulating monetary policy for commercial banks	4.29	85.73%	Strongly Agree
	The central bank is an effective tool in drawing supervision for commercial banks	4.02	80.40%	Agree
	Commercial banks comply with the decisions of the Central Bank	3.80	75.98%	Agree
<b>The general direction of the sub element</b>		4.10	82.14%	Agree
Sub elements	the scale	weighted average	%	direction
Commercial banks abide by the supervisory tools decided by the central banks	I see that commercial banks are sufficiently committed to what the Central Bank decides	4.16	83.29%	Agree
	Represents the commitment of commercial banks to the control tools imposed by the central banks, which represent an effective tool for customer support	4.08	81.50%	Agree
	Supervision of commercial banks is only one of the tools of central banks	4.09	81.78%	Agree
<b>The general direction of the sub element</b>		4.09	81.90%	Agree

There is sufficient awareness among those who draw up monetary policies at the Central Bank to take decisions regarding the business of commercial banks	Those in charge of banking policy are sufficiently aware of the control tools of commercial banks	4.16	83.28%	Agree
	Central banks represent the most important areas of internal and external control over banks	4.08	81.50%	Agree
	Central bank employees are sufficiently aware of the requirements of effective regulatory policies	4.28	85.68%	Strongly Agree
<b>Total</b>		4.17	83.49%	Agree

It is clear from the previous table that the general trend of responses to the total of the first axes, which is related to an axis, the nature and activity of the central bank with commercial banks does not differ, was “OK”, with an average of 4.28, while the trends of the sample’s responses were towards the second sub-axis “there is an effective role of central banks in policy-making.” The monetary and supervisory bank for commercial banks is "agree with severity", with an average of 4.10. As for the respondents' attitudes towards the items of the second sub-axis, "Creative Ability", it was OK with an average of 3.80. The following figures show the degree of relative importance of the inter-components of the sub-axes of the second axis of the questionnaire.

Analysis of the significance of differences between respondents' attitudes according to demographic variables

Significance of differences between sample responses according to gender: The research team relied on the results of the t-test to examine the significance of differences between males and females, and through the following table No. (6) and based on the value of the Sig test statistic, we find that there are no significant differences between each of the respondents according to gender for all The paragraphs of the first and second axis, all of which were higher than the value of the level of morale used by 5%, while there are differences between both males and females for the paragraphs of the third axis. Referring to the average values of the third axis, we find that the sample average for females is higher than for males, as it reached 1,842, while it reached 1.222 for males.

**Table No. (5): T-test to test the significance of differences according to gender**

Independent Samples Test	
Levene's Test for Equality of Variances	t-test for Equality of Means

		F	Sig.	t	df	Sig. (2- tailed )	Mean Differenc e	std. Error Differenc e	95% Confidence Interval of the difference	
									Lower	Upper
first axis	Equal variance s assumed	5.104	.026	1.124 -	100	.264	-.0584-	.0520	-.1615-	.0447
	Equal variance s not assumed			1.023 -	57.85 1	.310	-.0584-	.0570	-.1726-	.0558
second axis	Equal variance s assumed	.118	.732	-.110-	100	.912	-.0164-	.1491	-.3123-	.2794
	Equal variance s not assumed			-.111-	78.75 7	.912	-.0164-	.1486	-.3122-	.2793
third axis	Equal variance s assumed	22.529	.000	2.502 -	100	.014	-.3964-	.1584	-.7107-	-.0821 -
	Equal variance s not assumed			2.210 -	52.74 7	.031	-.3964-	.1793	-.7561-	-.0366 -
fourth Axis	Equal variance s assumed	.469	.273	-.385-	210	.931	-.2165-	.2496	-.4125-	.3779
	Equal variance s not assumed			-.334-	64,46 9	.624	-.0259-	.2595	-.4256-	.3654

Significance of differences between sample responses according to age: The ANOVA test was relied on to examine the difference between the sample responses according to age and through the following table and based on the statistical value of the Sig test, we find that there are no significant differences between each of the respondents in each of the different age groups, as all of them came

higher From the value of the level of significance used is 5%, which confirms that there are no significant differences in the responses according to the age variable.

**Table No. (6): T-test to test the significance of differences according to age**

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
first axis	Between Groups	.727	6	.121	1.987	.075
	Within Groups	5.793	95	.061		
	Total	6.520	101			
second axis	Between Groups	4.160	6	.693	1.348	.244
	Within Groups	48.860	95	.514		
	Total	53.020	101			
third axis	Between Groups	6.482	6	1.080	1.798	.108
	Within Groups	57.096	95	.601		
	Total	63.578	101			
fourth Axis	Between Groups	5.160	6	.793	2.983	.176
	Within Groups	34.860	95	.414		
	Total	76.020	101			

Significant differences between the sample responses according to the educational qualification: The ANOVA test was relied on to examine the difference between the sample responses according to the educational qualification and through the following table No. (9) depending on the value of the Sig statistician, we find that there are no significant differences between each of the respondents in each of the qualification categories The different scientific levels, for each of the first and second axes, all of which came higher than the value of the level of morale used 5%, which confirms that there are no significant differences in the responses according to the educational qualification variable for the first and second axes. While it was found that there is a difference between the sample responses according to the educational qualification towards the third axis. Where we find that the value of the Sig statistic is less than the 5% level of significance, which is 0.009.

**Table No. (7): T-test to test the significance of differences according to the educational qualification**

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
first axis	Between Groups	.721	4	.180	3.017	.022



	Within Groups	5.798	97	.060		
	Total	6.520	101			
second axis	Between Groups	4.631	4	1.158	2.321	.062
	Within Groups	48.389	97	.499		
	Total	53.020	101			
third axis	Between Groups	8.158	4	2.039	3.569	009
	Within Groups	55.421	97	.571		
	Total	63.578	101			

### Conclusion

The central bank represents a manifestation of economic sovereignty. It is a state-owned monetary institution located at the top of the banking system and undertakes the process of setting and implementing monetary policy. Although central banks in the world differ in terms of form and functions from one country to another, they are characterized by some general features and characteristics that make them a focus. It is considered the issuing bank, the bank of banks, and the government bank, and it undertakes the process of managing reserves and regulating credit, and uses a set of direct and indirect tools and means in its tool for its functions. Through the previous presentation as well as the statistical analysis of the research tool represented in the questionnaire distributed to the study sample, the study found that there is confusion between the nature and activity of the central bank with commercial banks. Which requires clarifying the lines between each of them. The study sample also agreed that there is an effective role for central banks in formulating monetary and supervisory policy for commercial banks. Commercial banks must also abide by the supervisory tools decided by the central banks. So achieve customer confidence, and check more warranty. The opinions of the study sample also tended that there is sufficient awareness among those who draw up monetary policies at the Central Bank to take decisions regarding the business of commercial banks.

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## Competencies And Learning Outcomes In Architecture Programs

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### Abstract

The study aims to analyze the specific competencies and learning outcomes of the Architecture program at the Universidad Francisco de Paula Santander. This process was carried out through a mixed methodological framework with a sequential exploratory design type, through which the regulations and documentation at international, national and institutional levels related to the specific competencies of the discipline of architecture were studied, prioritizing from the international framework the competencies with the highest level of relationship with the academic program, promoting their harmonization with the national and institutional regulations. A consultation instrument was implemented for teachers, graduates and students to assess their level of relationship concerning the curriculum and the pedagogical characteristics of the program, and finally, the specific competencies and learning outcomes were established according to the curricular guidelines of the institution. It was concluded that, at the Latin American level, the specific competencies of the architecture programs are focused on the relevance of the problems of the immediate environment, and that the teachers, students and graduates of the program found a greater relationship with those focused on the exercise of the architectural and/or urban project, as well as with the imaginative, creative, innovative and technological capacities.

**Keywords:** architecture; higher education; competencies; learning outcomes.

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## 1. Introduction

In Colombia, Law 30 (1992) organizes the public service of Higher Education, describing it in its different articles as follows:

A permanent process that allows the development of the potentialities of the human being in an integral way (...), Article 2...a cultural public service, inherent to the social purpose of the State (...), Article 4 ....which, without prejudice to the specific purposes of each field of knowledge,

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shall awaken in students a reflective spirit, aimed at achieving personal autonomy within a framework of freedom of thought and ideological pluralism that considers the universality of knowledge and the particularity of the cultural forms existing in the country (...) and shall be developed within a framework of freedom of teaching, learning, research and professorship.

A permanent process that makes possible the development of the potentialities of the human being in an integral way (...), Article 2...a cultural public service, inherent to the social purpose of the State (...), Article 4 ....which, without prejudice to the specific purposes of each field of knowledge, shall awaken in students a reflective spirit, aimed at achieving personal autonomy within a framework of freedom of thought and ideological pluralism that considers the universality of knowledge and the particularity of the cultural forms existing in the country (...) and shall be developed within a framework of freedom of teaching, learning, research and professorship.

## **2. Method**

The methodological framework of this research responds to the regulations related to the Ministry of Education, as well as institutions and organizations related to the discipline of Architecture in the national and international context; it was developed through a mixed approach through which we proceeded to recognize, analyze and interpret qualitative and quantitative data (Hamui, 2013) with a sequential exploratory design (Canese et al., 2021), a fact that favored the validation and understanding of a complex data that resulted in the understanding of the reality of the competencies approach in Architecture and decision making (Ugalde & Balbastre, 2013) for the specific competencies and learning outcomes of the Architecture program at the Universidad Francisco de Paula Santander (UFPS).

From the qualitative approach, to compile and analyze the competencies defined nationally and internationally for the discipline of Architecture, a documentary search was carried out, organized based on study matrices, which made it possible to identify associations and recurrences for each of the contexts. Then, from the quantitative approach, a survey was developed and applied to the following categories: Teacher, Student and Alumni; to assess using a Likert scale the level of relationship of the specific competencies resulting from the qualitative process for the Educational Project of the Architecture Program of the UFPS. Subsequently, the phase of interpretation and concretion of results and formulation of conclusions was carried out; finally allowing for compliance with the requirements of the Ministry of Education regarding the definition of competencies and learning outcomes in Higher Education Institutions.

## **3. Results**

This research consolidates the results obtained for the process of defining the competencies and learning outcomes of the UFPS Architecture program according to the guidelines established by Decree 1330 (2019) and Resolution 021795 (2020) and the institutional guidelines for the implementation of the curricular policy at the Universidad Francisco de Paula Santander, to establish criteria that guide the curricular update within the academic programs.

To this end, the results are structured based on three aspects of analysis: The first one contemplates the study of the documents that define within the international and national framework the specific competencies for the undergraduate degree in Architecture. Among these are Tunning Project (Vélez, 2013), Saber Pro-ICFES (ICFES, 2021), Resolution 2770 (2003) and the National Qualifications Framework. Catalog of qualifications for the construction sector (Colombian Chamber of Construction, 2020), the generic competencies established by the UFPS, the Institutional Educational Project (UFPS, 2021) and the Educational Project of the Architecture Program (UFPS, 2018).

The second aspect of analysis corresponded to the consultation carried out with teachers, students and graduates, in which the level of relationship of the practical and pedagogical work concerning the results obtained in the first aspect was established. Finally, a triangulation of information was carried out, which allowed the formulation of specific competencies and learning outcomes for the UFPS Architecture Program.

### 3.1. Basic and general competencies in architecture

For the study and documentary analysis of the specific competencies of the UFPS Architecture Program, the international, national and local scale was considered as a basis for consultation, taking as sources of information documents, books, studies and regulations directly associated with the pedagogical and practical work of Architecture (Table 1).

**Table 1.** Consultation Documents for Specific Competencies Program of UFPS Architecture

Study Scale	Document
International	Tuning Project (2011-2013)
National	Resolution 2770 (2003) Saber Pro-ICFES National Qualification Framework
Local	UFPS Institutional Educational Project Educational Project of the Architecture Program

The study took the international scale as its main component, taking into account the importance of the internationalization of the curriculum and pedagogical practices to promote the development of competencies on a global scale, which will allow the student of the Architecture program to perform successfully within a globalized and multiculturally diverse framework (Valdés, 2019). In this sense, it is highlighted that within the Tuning Project it was established that Latin American Architecture programs have been consistent and relevant to the needs and problems of their territories; for this reason, the curricula considered, as an articulating element, the subjects called “Design workshop or project design”; through which the direct connection of the theoretical and practical component of the subjects that make up the curricula is allowed (Vélez, 2013).

In the case of the Architecture program at UFPS (2018), the above becomes relevant when taking into account that:

The Design Workshop (...) beyond a sub-area, is a pedagogical and interdisciplinary strategy that structures the curriculum, strengthens the training purpose and consolidates the research training of the program. The workshop is the center of the professional training and is divided into the whole program in three basic training cycles as follows:

- Basic Cycle. Referring to semesters 1, 2, 3.
- Professional Cycle. Referred to semesters 4, 5, 6.
- Cycle of deepening Referred to semesters 7, 8, 9 and 10 (p. 43)

(...) the design workshop, as a guideline of the program, channels all areas of disciplinary knowledge (visual expression, technique, urban planning, design, theory and history) and

socio-humanistic and research (sociology, ethics, second language, research, statistics), developing creativity, debate, questions, wonder, intuition and the collective construction of knowledge (p. 50).

The Tunning 2011-2013 Educational and Social Innovation project defined 30 specific competencies for Architecture in Latin America, which were taken as a basis or support for study according to their relationship with the geographical context. The review made to this Project allowed the prioritization of four specific competencies (Table 2), under the identification of the level of recurrence and association they presented among them and their relationship with the Institutional Educational Project (UFPS, 2021) and the Educational Project of the Program (UFPS, 2018), where the pedagogical practices and curricular contents that reflect in the Being, Knowing and Know-how, defined in the profile of the Architect of the UFPS (Vélez, 2013) are established (Vélez, 2013).

**Table 2.** Specific competencies prioritized for the Architecture Program according to the Tunning project.

Tuning Competition Number	Description	Recurrence/Association Level
	Ability to design works of architecture and/or urban planning that integrally satisfy the requirements of human beings, society and its culture, adapting to the context.	
	Imaginative, creative, innovative and leadership skills in the design process of Architecture and Urbanism.	
	Mastery of the means and tools to communicate ideas and projects, both urban and architectural, orally, in writing, graphically and/or volumetrically.	5
	Ability to develop urban architectural projects that guarantee sustainable and environmentally, socially, culturally and economically sustainable development.	

**Source:** Velez, 2013.

As part of the process, an analysis was made of what is described in Article 2 of Resolution 2770 (2003) of the Ministry of Education, which defines the specific quality characteristics for the academic programs of Architecture following the provisions of Decree 2566 (2003), which regulates the minimum quality conditions and other requirements for the offering and development of academic programs of Higher Education. This analysis included the establishment of the level of association to the specific competencies prioritized for the UFPS Architecture Program according to the Tunning project (See Table 3).

**Table 3.** Association between Resolution 2770 (2003) and the prioritized competencies of Tunning for the UFPS Architecture program.

Resolution 2770 of November 13, 2003		
No Item Res.	Specific Quality Characteristics of Undergraduate Programs in Architecture	Association
		Prioritized competencies Tunning
Article 2: Curricular Aspects. The program must be consistent with the theoretical, practical and methodological foundations of architecture and with the principles and purposes that guide its formation from an integral perspective, considering, among other aspects, the competencies and knowledge that the Architect is expected to		

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possess. Likewise, it must be consistent with the regulations that govern their professional practice in the country.

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1. Every Professional Architecture Program will strive to:

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- |      |   |           |
|------|---|-----------|
| 1.1  | A solid training that guarantees the ability to interpret and solve problems related to the transformation and organization of the physical space, following the socio-cultural and environmental characteristics of the country. | 4,21      |
| 1.2. | Ethical training within a conception of professional practice based on human, social, cultural and democratic values.   |           |
| 1.3. | Commitment to a vision of architecture oriented to the resolution of local, regional and national problems, in rural and urban environments.  |           |
| 1.4. | Responsibility for the architectural and urban heritage, and in general to the cultural and artistic heritage, and the construction of identity paths.  | ME (4,21) |
| 1.5. | Scientific training to innovate in the fields of knowledge related to constructive, aesthetic, planned and humanistic systems and approaches.   |           |
| 1.6. | The culture of interdisciplinary work to interact with professionals from other areas.  |           |
- 

2. The program must ensure the development of cognitive and communicative competencies in the mother tongue and in a second language, as well as the socio-affective competencies necessary for professional practice, as well as the capacities for group and interdisciplinary work, which will allow them to perform in the following fields:

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- |     |   |           |
|-----|---|-----------|
| 2.1 | Architectural design: This involves the study, elaboration and coordination of architectural projects in different fields and scales. Also includes landscaping projects  | 4,21      |
| 2.2 | Management and technological innovation: This involves the management and coordination of the works necessary for the construction of architectural and urban projects in their different constituent aspects. It includes the preparation of budgets, construction scheduling, construction site management and supervision. | ME (4,21) |
| 2.3 | Heritage intervention: This involves the valuation, conservation, management and intervention of the national, regional and local urban and architectural heritage.   | ME (4,21) |
| 2.4 | Urban planning: This involves interdisciplinary work in the definition of territorial and urban planning plans and projects. It also includes urban design projects and urban and territorial landscaping.  |           |
| 2.5 | Public and private management: This involves the performance of public and private administration activities related to the territory, the city and architecture.   | 4,21      |
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3. For the achievement of the integral formation of the Architect, the basic curriculum shall comprise, as a minimum, the following components of the basic and professional training areas, fundamental areas of knowledge and practice that identify the field of architecture, which should not be understood as a list of subjects:

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- |     |  |  |
|-----|--|--|
| 3.1 | Basic training area: Includes knowledge and practices.<br><br>necessary for the foundation of the professional field of architecture; it contemplates the following component: |  |
|-----|--|--|

- 3.1.1 Component of the theory of architecture and the city: seeks to sensitize the student in the understanding and appreciation of urban and architectural heritage, in its historical and contemporary dimensions. It includes the history and theories of architecture and urban design; it presents close relationships with the history of ideas and art, with cultural and landscape studies, with the paradigms of philosophy, aesthetics and other social developments. It includes training in the knowledge of the laws of culture and the norms concerning heritage in force in the country. ME (4,21)
- 3.2 Professional training area: Includes knowledge and practices related to the following components:
- 3.2.1 Project component: Central axis of the architect's training must be the academic space for the synthesis of the other components of knowledge and practice involved in the architect's training, it must be present at all levels of training throughout the program. It is oriented to form in the student the capacity to synthesize a great variety of cultural, disciplinary, contextual and technological information, using it to support the project. It allows the development of creative and critical thinking, and the necessary design skills for the elaboration of proposals, as well as the necessary communicative competencies for their definition and socialization. 15,4,21
- 3.2.2 Representation and graphic expression component: Aimed at training students in the skills required for the representation of projects in the different stages of their gestation; in the principles of construction technologies, such as structures, construction, materials, and designs of environments that respond to human needs. Through this component, students should develop skills for the use of tools that allow the representation of three-dimensional spaces. It also requires the use of geometry, drawing and other manual and digital tools that allow them to understand and represent space in design projects that integrate technical, aesthetic and social criteria.
- 3.2.3 Technological component: Aimed at training the student in the theories and principles of available technologies; in the properties and meaning of materials and how they influence design; in the criteria for construction management; in the laws and regulations in force in the country related to safety, health and comfort, required in the construction processes and occupation of places. All of the above must be guided by respect for the environment and the promotion of sustainable human development.
- 3.2.4 Urban and environmental component: Trains the student in the understanding of the territorial, urban and environmental aspects of the object of professional intervention. It requires an understanding of the interdisciplinary dimension of the problems of the city, the territory and the environment. It trains the student in the formulation of territorial and urban planning plans and projects, as well as urban design and landscaping projects. It includes training in the laws and regulations in force in the country related to the subject. 4,21,9
- 3.2.5 Professional practice component: Aims to train students in skills for understanding the factors inherent to their professional performance: ethical, social, economic and cultural aspects. It also aims to develop in the student competencies for autonomous and collaborative work in interdisciplinary environments, and project management.
- 3.3 Area of Emphasis: The institution may define one or several emphases of GC, (9)



professional application of the program that allows to attend professional diversification options and satisfy the particular interests of the students.

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Paragraph. Each institution shall organize within its curriculum these areas and their components, as well as others it considers pertinent, in correspondence with its mission and institutional project.

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\* Conventions: N/A Not applicable, ME: Very Specific, GC: Generic Competence.

Skills to design works of architecture and/or urbanism that integrally satisfy the requirements of the human being, society and its culture, adapting to the context. 9. Imaginative, creative, innovative and leadership capacity in the design process of Architecture and Urbanism. 15. Mastery of the means and tools to communicate orally, in writing, graphically and/or volumetrically the ideas and projects, both urban and architectural. 21. Ability to develop urban architectural projects that guarantee sustainable and environmentally, socially, culturally and economically sustainable development.

**Source:** Own elaboration based on Mineducación, 2003.

On the other hand, the Qualification Framework of the Construction sector (Colombian Chamber of Construction, 2020) was reviewed at qualification level 6 in the denomination of Architecture, a project whose purpose is to design the qualifications of the construction sector, taking into account the methodology of the National Qualifications Framework (NQF), establishing a point of articulation between the productive sector and the labor market (Table 4).

**Table 4.** Association between the Qualification Catalog of the construction sector and the prioritized competencies of the Tunning for the UFPS Architecture program.

No ITEM	Specific competencies Construction industry qualification catalog	Association Prioritized competencies Tunning
CE01.	Formulate construction projects based on client requirements, technical information and associated regulations (Transversal).	4,9
CE02.	Design the architecture of building construction projects based on technical requirements, architectural design principles and associated regulations.	4,21
CE03.	Design the urban planning of construction projects based on identified needs, urban design principles and associated regulations.	4,21
CE04.	Design the landscaping of building and infrastructure construction projects based on landscape design principles, technical information and associated regulations.	4,21
CE05.	Design the interior design of construction projects based on the client's needs, the principles of interior design and the architecture of the site.	ME
CE06.	Develop bioclimatic architecture strategies in building construction projects, following the environmental conditions of the surroundings, sustainability criteria and energy efficiency.	4,21
CE07.	Prepare technical information in proposals for architectural services based on the terms of reference of public or private entities.	ME
CE08.	Restore architectural heritage buildings according to studies and technical criteria.	ME
CE09.	Develop universal design components in the architecture of construction projects according to their characteristics, accessibility criteria and associated regulations.	4,9,21
CE10.	Plan the construction project under the designs, contractual conditions and associated regulations (Transversal).	ME
CE11.	Control the technical-administrative development of the construction work by the schedule, technical specifications and associated regulations (Transversal).	ME
CE12.	Coordinate the activities of completed projects under procedures, maintenance requirements and contractual agreements (Transversal).	ME

CE13.	Manage the quality of virtual models of construction projects according to the execution plan, the phase of the project life cycle and the available technology (Transversal).	9,15
CE14.	Coordinate the specialties in the generation of virtual models of construction projects according to the execution plan, the interrelation of disciplines and the available technology (Transversal).	9,15

\* Conventions: N/A Not applicable, ME: Very Specific, GC: Generic Competence.

Note: Prioritized competencies according to Tunning: 4. Ability to design works of architecture and/or urbanism that integrally satisfy the requirements of the human being, society and its culture, adapting to the context. 9. Imaginative, creative, innovative and leadership capacity in the design process of Architecture and Urban Planning. 15. Mastery of the means and tools to communicate orally, in writing, graphically and/or volumetrically the ideas and projects, both urban and architectural. 21. Ability to develop urban architectural projects that guarantee sustainable and environmentally, socially, culturally and economically sustainable development.

**Source:** Own elaboration based on Cámara Colombiana de la Construcción (2020).

Consequently, the Architecture Project Module of the Saber Pro tests (ICFES, 2021) was reviewed, which allows, based on a specific assignment or project, to evaluate processes associated with comprehension, analysis, argumentation and evaluation based on historical-theoretical, technical, spatial and urban components (p. 8) (Table 5).

**Table 5.** Association between the specific competencies Saber Pro Architecture Project Module and the prioritized competencies of the Tunning for the UFPS Architecture program.

Item	Specific competencies Architecture project module Saber Pro	Association Prioritized competencies Tunning
a.	Analyze / Interpret: Interpreting is a process that starts with the analysis of the available information and continues with the management and relationship of the information, linking it to the different project components. Understanding involves identifying the relationships and hierarchies required in the project components.	
Urban-spatial	It understands the relationship between architecture and the city, which satisfies the requirements of human beings, society and its culture by adapting them to the context.	4,21
Urban-spatial	Understands and interprets the legal and technical regulations governing the field of architecture.	4,21,9
Formal -Spatial	Knows spatial elements and structures that concretize in objects the architectural ideas, which are specific to the context in which it will be projected.	4,21,9
Formal -Spatial	Knows the principles of geometry, composition, and visual and spatial perception.	9,15
Technological	Interprets the relationship between materiality and environmental, social and cultural context. Interprets the relationship between environmental preexistences and comfort and bioclimatic conditions.	4,21,9
Functional	It interprets the relationship between architectural themes and the urban environment in terms of processes through which programs and their spaces are understood and characterized. In the test, the student must take into account the contextual preexistences, the demands to be	4,21,9

met by the project -both the architectural program of functions and areas, as well as the basic regulations-, and the cultural context -reflected in the city selected by the student-.

b. Conceptualize / Justify-argue: It is about logically and sequentially articulating the architectural ideas in such a way that the rationality of all the project decisions can be appreciated according to clear and current criteria in the development of the proposed project, taking into account the conditions and needs established in the contextual information.		
Urban- Environmental	Interprets urban and architectural spaces that meet the housing needs of human beings.	4,21
Urban- Environmental	Value the natural elements that are part of the context to involve them in architectural and urban projects.	4,21
Urban- Environmental	Interprets urban elements and systems as conditions of architectural design.	
Formal-Spatial	Integrate the knowledge of the models and the spatiality that is generated, so that they contribute to the conceptualization of the proposal.	9,15
Technological	Coordinates, analyzes and synthesizes information from technical processes involved in architectural and urban planning projects.	9,15
Technological	Analyzes inherent and comfortable physical phenomena inherent to architecture to generate spaces.	4,21
Functional	It characterizes and conceptualizes the program with which the project operations of architecture and urban planning are justified.	9,15
Functional	It is expected that in the development of architectural ideas of a complex system. The student resorts to theoretical foundations as design tools, to intervene the physical context, and expose the criteria on which each decision is based in the different components, to form the project as a complex system.	9,15
c. Propose / Develop: Consists of translating the architectural ideas proposed in the conceptualization into architectural codes. Consideration is given to codes of representation -plans, cuts, elevations, axonometrics, perspectives, among others-, spatial codes -of the scale of intervention, proportions, relationships-, technical codes -related to construction systems and materials- and codes of social organization embodied in the proposal made for a specific cultural context.		
Urban- Environmental	It responds with the architectural and urban project to the site conditions, bioclimatic, landscape and topography of each location, according to the region where it is located.	4,21
Urban- Environmental	Develops architectural and urban projects that contemplate sustainability in the environmental, social, cultural and economic fields.	4,21
Formal - Spatial	It proposes the formal structure compatible with the use and context, as well as the spatial sequence and order appropriate to such a formal structure.	4,9,15,21
Technological	Proposes and applies information from technical processes and develops them in architectural and urban projects.	
Technological	Applies and develops the architectural project with technical criteria about the detail and allowing the materialization of the architectural and urbanistic project.	4,21,9
Functional	Coherently integrates and develops the pragmatic relationships that define the themes of architecture and urban planning.	4,9,15,21

Communicative	Converts ideas into codes of representation that respond to the principles of geometry and visual and spatial perception.	
Communicative	Communicates graphically the project through the use of two- and three-dimensional graphic representation techniques.	9, 15
Communicative	Consistently applies the codes of technical drawing in architecture and construction.	

\* Conventions: N/A Not applicable, ME: Very Specific, GC: Generic Competence.

Note: Prioritized competencies according to Tunning: 4. Ability to design works of architecture and/or urbanism that integrally satisfy the requirements of human beings, society and its culture, adapting to the context. 9. Imaginative, creative, innovative and leadership capacity in the design process of Architecture and Urbanism. 15. Mastery of the means and tools to communicate orally, in writing, graphically and/or volumetrically the ideas and projects, both urban and architectural. 21. Ability to develop urban architectural projects that guarantee sustainable and environmentally, socially, culturally and economically sustainable development.

**Source:** Own elaboration based on ICFES, 2021.

Finally, the institutional framework of the UFPS was reviewed, specifically referring to the Institutional Educational Project PEI (UFPS, 2021) and the Educational Project of the program PEP (UFPS, 2018), considering the aspects that comply with what is established by the program in its mission and vision, the objectives set, the professional profile of the Architecture Graduate and what refers to compliance with the institutional framework (See Table 6).

**Table 6.** Association between the Institutional Educational Project PEI. Educational Project PEP Program and the prioritized competencies of Tunning for the UFPS Architecture program.

Item	Institutional Educational Project PEI Educational Project WBS Program	Partnership Prioritized competencies Tunning
UFPS Mission	The Universidad Francisco de Paula Santander is a Public Institution of Higher Education, oriented to continuous improvement and quality in the processes of teaching, research and extension, within the framework of face-to-face, distance and virtual methodological strategies, whose fundamental purpose is the comprehensive training of professionals committed to solving environmental problems, in search of sustainable development of the region.	4,21
UFPS Vision	In the year 2025, we will be a high-quality accredited university, recognized for excellence and efficiency in the exercise of our mission functions with a global focus, placing value on the potential of the university community and participating in the changes of the environment through the transfer of knowledge and innovation, contributing to the sustainable development of society.	4,9,15,21
Challenging objective UFPS	To be recognized nationally as an institution of higher education for the quality in the training of professionals and the commitment to continuous improvement in pursuit of excellence in its teaching, research and social projection processes.	GC

	The undergraduate programs at UFPS allow the development of competencies derived from a process of theoretical and practical learning in a specific area of science. It involves research and permanent interaction with the regional, national and international context to respond accurately to the challenges and programs that arise.	4,21
	The conception of the pedagogical approach:	9,15,4,21
PEI	*Questions as a fundamental pedagogical tool for the development of critical thinking.	
UFPS	*The approach of real problems based on students' experiences as active participants of a social group.	
	*Case studies based on the review of the state of the art on problematic issues, inquiry and preparation of the problematic issues of the class, permanent discussions, writing texts, creative proposals, ingenious responses of students to the resolution of critical problems, problem-based teaching (EBP), portfolio methodology, the investigative seminar or German, the use of learning guides.	
Mission Architecture	The Architecture program trains professionals in various emphases of professional application in a comprehensive manner, emphasizing the generation of knowledge, the transfer of science and technology, seeking the development of human and social qualities to strengthen scientific, creative and investigative concerns, with a constructive critical attitude that allows a professional sensitive to the problems of the environment with a sense of social belonging, for sustainable development.	4,21,9,15
Vision Architecture	The Architecture program will be recognized nationally and internationally for its high academic quality, competitiveness and social relevance, with influence in the decisions committed to the construction of the habitat of the environment; leading the transformation of the territory from creativity, innovation and technological adaptation with ethical sense.	4,21,9,15
Target	To develop in the student a scale of values for peace and inclusion, based on individual and collective esteem, which allows personal and professional development in an ethical, respectful and responsible manner.	GC
	Promote in the student the entrepreneurial and cooperative spirit that allows him/her to meet opportunities with leadership in interdisciplinary teams.	GC
	Promote the production of knowledge from creative and research activities that, through participatory actions, propose relevant solutions to the binational, regional and local context.	4,21,9
	To train integral professional architects with the capacity to propose proposals aimed at improving the quality of life in the different fields of architecture and urban phenomena.	4,21

Professional Profile	From this perspective, the graduate of the Study Plan assumes a suitable professional profile and reflective spirit, assuming in the academy a creative, transformative and investigative attitude that helps to improve the quality of the physical spaces of their environment, by recognizing, understanding and proposing urban-architectural developments in design and materialization in the construction of the social fabric, framing their action in legality.	4,9
	It is a professional who recognizes and disseminates the arts, protects and promotes culture and architectural heritage, stimulating the potential of the human being, solving with intuition and creativity within the principles of plurality and democracy to rationally assume the autonomy and personal growth of the architect as a professional, in contribution with his fellow citizens.	4,9
The UFPS Architect	In his professional work, he creates, from his cultural dimension, dialogue and respect for differences through the critical apprehension of knowledge and the understanding of the social value of knowledge. From his profession, he guides and transforms the scenarios of physical spaces, as well as the architectural and environmental heritage framed in the principles of sustainability and sustainability.	4,21
	An architect who in his theoretical and professional praxis creatively expresses the knowledge of the profession of architecture and recognizes in the historical development of humanity a point of impulse for the educability of man and a tool to understand and solve problems of his environment.	4,21
	That is why they are formed as integral professionals based on valuing ethics in urban and architectural practice as a social responsibility, from self-realization from autonomy or participation in work teams, with an entrepreneurial spirit, with interest in updating and with strengths in communication aimed at progress through technological, human and social development.	4,21,15,9
Graduate Profile - Being	Ethical professional, aware of reality, with social commitment.	4,21
	Professional with the ability to propose solutions for the improvement of the quality of life.	
	Leader of participatory work processes for the management and generation of policies and standards associated with Architecture and Territory.	4,9,21
Graduate Profile- Saber	Understands the Integral Dimension of their discipline.	4,9,15,21
	Understand the Dynamics of the Context in which it develops.	4,21
	Architect with strengths in the technical, technological and administrative management of construction projects.	9,15
	Analyzes and diagnoses the city from its social, political, economic, environmental and physical dimensions, to build arguments to support comprehensive actions in the territory.	

	It frames the practice of architecture and urban interventions in the recognition and application of the normative and legal framework in force.	4,21
Graduate Profile Do	Orients his professional work towards the solution of housing deficiencies in his context.	4,21
	Plans and develops architectural and/or urban projects in its multiple scales for the growth, transformation and conservation of the city.	4,21
	Professional who proposes new constructive, technological and housing alternatives to the reality of their immediate environment.	9,15
	Architect with critical awareness to address architectural intervention, protection and conservation, facilitating dialogue between previous architecture and new proposals.	4,21
PEP	The program is based on strategic guidelines: The formative, which intertwines the conceptual foundations perceptible in the curriculum; architectural design, urban design and construction technology.	4,21,15,9
	Three training cycles: The Basic Cycle (first, second and third semesters), The Professionalization Cycle (fourth, fifth and sixth semesters) and the Deepening Cycle (seventh, eighth, ninth and tenth semesters).	4,21,15,9
	The Study Plan includes subjects distributed among the areas of basic training, professional training, socio-humanistic training and research training. With elective subjects, of which (4) disciplinary and (4) interdisciplinary are required for graduation.	4,21,15,9

\* Conventions: N/A Not applicable, ME: Very Specific, GC: Generic Competence.

Note: Prioritized competencies according to Tunning: 4. Ability to design works of architecture and/or urbanism that integrally satisfy the requirements of the human being, society and its culture, adapting to the context. Imaginative, creative, innovative and leadership capacity in the design process of Architecture and Urbanism. 15. Mastery of the means and tools to communicate orally, in writing, graphically and/or volumetrically the ideas and projects, both urban and architectural. 21. Ability to develop urban architectural projects that guarantee sustainable and environmentally, socially, culturally and economically sustainable development.

**Source:** Own elaboration based on ICFES, 2021.

### 3.2. Assessment of specific competencies in architecture

Once the analysis corresponding to the international, national and institutional framework was developed, with their respective association of the specific competencies presented in each of them for those prioritized for the Architecture program from the Tunning, we proceeded from the quantitative methodological approach to the application of a survey to the Teaching, Student and Alumni estates, which allowed to assess from a Likert scale the level of relationship of the specific competencies prioritized for the program for the educational project of the Architecture program of the UFPS.

The Likert rating scale present in the instrument (See Table 7) corresponded to:

Nothing related.

2. Poorly related.

3. Fairly closely related.

## 4. Deeply related.

This instrument was applied to a sample corresponding to all the teachers (27) who provide direct service to the Architecture program through the Department of Architecture, Design and Urbanism, in the case of students the sample corresponded to 70 and the graduates of the program, the sample was of 121.

**Table 7.** Assessment instrument applied to teachers, students and graduates.

Specific Competencies Architecture Program	
Institutional Mail:	
Name:	
1. Ability to design works of architecture and/or urban planning that integrally satisfy the requirements of human beings, society and its culture, adapting to the context.	Nothing Related 1234 Deeply Related
2. Imaginative, creative, innovative, technological and leadership skills in the design process of architecture and urbanism.	Nothing Related 1234 Deeply related
3. Mastery of the means and tools to communicate orally, in writing, graphically (analog-digital) and/or volumetrically the ideas or projects, both urban and architectural.	Nothing Related 1234 Deeply Related
4. Ability to develop urban architectural projects that guarantee sustainable and environmentally, socially, culturally and economically sustainable development.	Nothing Related 1234 Deeply related

**Source:** Own elaboration.

As can be seen in Table 8, the teachers of the Architecture program manifested from their academic work and the development of their pedagogical practices a higher level of relationship corresponding to the prioritized competence number 4 (77.8%), followed by the prioritized competence number 9 (33.3%).

**Table 8.** Results of teacher evaluation.

#	Prioritized program competencies according to Tunning	1		
	Ability to design works of architecture and/or urban planning that integrally satisfy the requirements of human beings, society and its culture, adapting to the context.	1/27 (3,7%)		21/27 (77,8%)
	Imaginative, creative, innovative, technological and leadership skills in the design process of architecture and urban planning.	9/27 (33,3%)		18/27 (66,7%)
	Mastery of the means and tools to communicate orally, in writing, graphically (analog-digital) and/or volumetrically the ideas or projects, both urban and architectural.	3/27 (11,1%)	8/27 (29,6%)	16/27 (59,3%)
	Ability to develop urban architectural projects that guarantee sustainable and environmentally, socially, culturally and economically sustainable development.		8/26 (29,6%)	19/27 (70,4%)

Table 9 shows the results corresponding to the student body, which valued with a higher level of relationship the prioritized competency number 9 (54.3%), followed by the prioritized competency number 4 (51.4%).

**Table 9.** Results of student assessment.

#	Prioritized program competencies according to Tunning	1
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Ability to design works of architecture and/or urbanism that satisfy integrally the requirements of human beings, society and its culture, adapting to the context.	0	1/70 (1,4%)	36/70 (51,4%)	33/70 (47,1%)
Imaginative, creative, innovative, technological and leadership skills in the design process of architecture and urban planning.	0	3/70 (4,3%)	29/70 (41,4%)	38/70 (54,3%)
Mastery of the means and tools to communicate orally, in writing, graphically (analog-digital) and/or volumetrically the ideas or projects, both urban and architectural.	4/70 (5,7%)	7/70 (10%)	25/70 (35,7%)	34/70 (48,6%)
Ability to develop urban architectural projects that guarantee sustainable and environmentally, socially, culturally and economically sustainable development.	0	9/70 (12,9%)	28/70 (40,0%)	33/70 (47,1%)

**Source:** Own elaboration.

Table 10 shows the results corresponding to the graduates, who valued with a higher level of relationship the prioritized competency number 4 (83%), followed by the prioritized competency number 15 (68%).

**Table 10.** Results of graduate evaluation.

#	Prioritized program competencies according to Tunning	1			
	Ability to design works of architecture and/or urbanism that satisfy integrally the requirements of human beings, society and its culture, adapting to the context.	0	0	9/121 (17%)	44/121 (83%)
	Imaginative, creative, innovative, technological and leadership skills in the architectural and urban design process.	0	0	28/121 (53%)	25/121 (47%)
	Mastery of the means and tools to communicate orally, in writing, graphically (analog-digital) and/or volumetrically the ideas or projects, both urban and architectural.	0	0	36/121 (68%)	17/121 (32,0%)
	Ability to develop urban architectural projects that guarantee sustainable and environmentally, socially, culturally and economically sustainable development.	0	0	10/121 (19%)	43/121 (81%)

**Source:** Own elaboration.

### 3.3. Definition of specific competencies for the Architecture program

The generic competencies and learning outcomes adopted by the UFPS are presented below. In this sense, each program of the institution must adopt for its subjects one (1) generic competency with its respective learning outcome, in compliance with the institutional guidelines related to the curricular policy (See Table 11).

**Table 11.** Results of evaluation of graduates.

Code	Generic Competencies	Learning outcomes
	UFPS	UFPS
CG1. Continuous Reasoning	Solve problems involving quantitative information and mathematical objects in different formats (texts, tables, graphs, charts, diagrams, schemes) that allow a citizen to take an active and informed part in social, cultural, political, administrative, economic, educational	Apply mathematical knowledge and skills in the solution of problem situations that arise in everyday and professional contexts involving quantitative information.

	and labor contexts.	
CG2. Communicative	Communicate effectively in the native language and in a second language with a variety of audiences using diverse media	Demonstrate the skills necessary for lifelong and life-wide learning.
CG3. Citizenship, Ethics and Criticism	To recognize ethics, social responsibility and citizen commitment from a critical and self-critical point of view, assuming their actions as active social subjects of rights, so that they can fully exercise their citizenship, respecting the principles and values built in community, with a sense of justice in the sustainable care of the environment.	Work together and collaboratively with other peers in diverse roles seeking to solve problems in diverse contexts.
CG4. Teamwork	The ability to function effectively in teams whose members collectively provide leadership, create a collaborative and inclusive environment, set goals, plan tasks and accomplish objectives.	Demonstrate ethical behavior in diverse contexts based on universal principles and values, analyzing the different perspectives present in diverse environments where the rights and duties of the citizen are involved.
CG5. Continuous Learning	Demonstrate dynamic actions of constant updating and adaptation to a changing environment, applied to both professional and personal life. It is about being in permanent training.	Effectively use oral and written communication through reports, working papers, presentations, exhibitions or in work meetings.  Communicate by means of frequently used and professional expressions in a second language.

**Source:** Own elaboration.

The definition of the specific competencies was carried out based on the prioritization of the competencies of the Tunning Project developed in the first part of this research, added to the quantitative assessment developed by teachers, students and graduates of the UFPS Architecture program in harmony with the guiding principles that are part of the UFPS Architecture program (See Table 12).

**Table 12.** Guiding principles for the Architecture program UFPS

Guiding Principles Architecture Program UFPS	
Aspects of Interest	Prioritized competencies Tunning
The program is based on strategic guidelines: The formative, which intertwines the conceptual foundations perceptible in the curriculum; architectural design, urban design and construction technology.	4,21,15,9
Three training cycles: The Basic Cycle (first, second and third semesters), The Professionalization Cycle (fourth, fifth and sixth semesters) and the Deepening Cycle (seventh, eighth, ninth and tenth semesters).	4,21,15,9
The Study Plan includes subjects distributed among the areas of basic training, professional training, socio-humanistic training and research training. With elective subjects, of which (4) disciplinary and (4) interdisciplinary subjects are required for graduation.	4,21,15,9

\* Conventions: N/A Not applicable, ME: Very Specific, GC: Generic Competence.

Note: Prioritized competencies according to Tunning: 4. Ability to design works of architecture and/or urbanism that integrally satisfy the requirements of human beings, society and its culture, adapting to the context. 9. Imaginative, creative, innovative and leadership capacity in the design process of Architecture and Urban Planning. 15. Mastery of the means and tools to communicate orally, in writing, graphically and/or volumetrically the ideas and projects, both urban and architectural. 21. Ability to develop urban architectural projects that guarantee sustainable and environmentally, socially, culturally and economically sustainable development.

**Source:** Own elaboration.

Taking into account the proximity of the percentage values obtained in the assessment made by the teachers, students and graduates of the architecture program and in compliance with the institutional requirements through which the academic programs were asked to propose two (2) specific competencies, a process of association and integration between the prioritized competencies was carried out, taking into account the type of skills, attitudes and values (UFPS Architect profile) of each one of them. In this way, the two specific competencies of the Architecture program were defined (See Table 13).

**Table 13.** Specific competencies of the Architecture program UFPS

No	Specific Competencies
CE1	Imaginative, creative, innovative, technological, entrepreneurial and leadership skills to communicate orally, in writing, graphically (analog-digital) and/or volumetrically the design process of architecture and urbanism.
CE2	Ability to design architectural and/or urban planning works that satisfy integrally the requirements of human beings, society and its culture, adapting to the context, guaranteeing sustainable and sustainable development and improving the quality of life in the territory.

**Source:** Own elaboration.

### 3.4. Construction of learning outcomes

The UFPS (2022) through the document “Curricular Aspects for the Academic Programs of the UFPS” establishes that the learning outcomes of an academic program must be harmonized with its graduation profile. Among the most representative characteristics of the learning outcomes, it mentions that they must be observable, measurable and, above all, susceptible to evaluation.

(...) Each learning outcome contained in the Learning Outcome Profile must refer to the domain of knowing, knowing how to do, knowing how to be/to live, or a combination of the three domains or two of them.

Some guiding questions for its formulation:

1. What is the student expected to demonstrate at the end of his or her training cycle at the University?
2. What must the student demonstrations to receive his or her degree?
3. How do those performances serve or are useful for your professional practice (...) (p. 33)?

Within the guidelines, the University established that for the development of the Learning Results (LR), Bloom's Taxonomy should be implemented, taking into account that it favors a reflection on the levels of competence acquired by the students, according to levels of increasing complexity and a cognitive, psychomotor and affective domain (Krathwohl, 2002). The above, so that academic programs can be based on their nature and formative intention, carry out an evaluation process, taking into account elements of the curriculum such as formative activities, evaluation techniques and instruments (Figure 1).

**Figure 1:** Construction method Learning Outcome

**Source:** UFPS, 2022.

In this sense, and following the guidelines defined by the institution for the construction of learning outcomes, the study proceeded to define those corresponding to the architecture program (Table 14).

**Table 14.** Specific competencies and learning outcomes of the UFPS Architecture program.

Code	Specific Competencies	Code	Learning Outcome
CE1	Imaginative, creative, innovative, technological, entrepreneurial and leadership skills to communicate orally, in writing, graphically (analog-digital) and/or volumetrically the design process of architecture and urbanism.	RA1	Communicate orally, in writing, graphically (analog-digital) and/or volumetrically, Architectural or Urban processes and/or projects in their multiple scales, using the Principles, theory and concepts of Architecture for the growth, transformation and conservation of the territory.
CE2	Ability to design architectural and/or urban planning works that fully satisfy the requirements of human beings, society and its culture, adapting to the context, guaranteeing sustainable and sustainable development and improving the quality of life in the territory.	RA2	Design projects, architectural and/or urban planning works that respond to social, cultural, political, economic and environmental dimensions and needs, with arguments that support integral actions in their immediate surroundings and in the territory.

**Source:** Own elaboration

#### 4. Conclusions

This research condenses the analysis process carried out by the Architecture program, following the parameters established by the Academic Vice-Rector of the UFPS for the construction of the Specific Competencies of the program and their respective Learning Outcomes. In this sense, the research focused in the first stage on the documentary analysis from the international framework where the discipline of Architecture is reflected, highlighting references such as the Tunning project, and within the national framework other references such as Resolution 2770 (2003) in which the specific quality characteristics of the Architecture program are defined, the national qualification framework, the Saber Pro tests of the ICFES; and institutionally the mission, vision and institutional objectives as well as the mission, vision, professional and graduation profile and the Educational Project of the Architecture program.

From the international (Latin American) point of view, it was found that the specific competencies proposed are associated with the theoretical and practical components aimed at the relevance of the programs for the problems of their immediate environments, highlighting as an articulating element the subjects of Design Workshops. Concerning national regulations, it was found that the Ministry of Education has been in charge of adjusting national regulations, understanding the student as the main and primordial element of the educational process, in addition, it was found that both the international and national perspective presents a synergy aimed at the formation of integral architects relevant to the problems of their immediate environments. In this sense, the UFPS has also directed actions and strategies that allow it to respond to a globalized vision from undergraduate education, where graduates have a successful performance.

For the results obtained in the quantitative phase where a consultation instrument was implemented with teachers, students and graduates of the Architecture program, it should be mentioned that each of the consulted estates evidenced a level of understanding and acceptance for the prioritized competencies, this favored the level of relationship of the competencies for the activities, pedagogical practices of the academic work of the architecture program. It is also highlighted that the competencies with the highest level of relationship corresponded to competency number 4: Ability to project works of architecture and/or urbanism that integrally satisfy the requirements of human beings, society and its culture, adapting to the context, and competency number 9: Imaginative, creative, innovative, technological and leadership capacity in the design process of architecture and urbanism.

The process carried out within this research favored the construction of Specific Competencies and Learning Outcomes that respond to the international and national challenges and requirements, and that are harmonized with both the guidelines and the mission objectives of the institution. It should be noted that the specific competencies and learning outcomes established for the architecture program respond to the strategic guidelines and conceptual foundations that frame the curriculum from the fields of architectural design, urban design and construction technology reflected in the professional work from the practical and theoretical aspects. Likewise, they are immersed in and respond to the training cycles: Basic, professionalization and deepening, and to the basic, professional, socio-humanistic and investigative training axes that determine the graduate profile.

The above shows that UFPS Architecture students present diverse capacities related to oral, written, graphic and volumetric communication from the analog or digital, as well as skills to project architectural and/or urban planning works at various scales in favor of improving the quality of life of the inhabitants and the satisfaction of their requirements, under proposals that provide a comprehensive response to the needs of their immediate environment and promote the improvement of the territory.

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# The Morphosyntax Of Verbal Negation In Rural Jordanian Arabic

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## Abstract

The aim of this paper is to investigate the morphosyntax of verbal negation and the syntactic behavior of the pseudo verbs *ʕind* (at - have), and *maʕ* (with -have) when they undergo negation in Rural Jordanian Arabic (RJA). Based on the analysis of naturally occurring data in RJA, this study reveals that the diffusion of negation varies according to the position of the negative particles and the negated component. In perfective aspects, both *ma* and *ma-... iʕ* can achieve the negation. Apart from the perfective verbs and the pseudo-verb *ʕind*, *-iʕ* can perform the negation alone without the particle *ma-* with all other verbs and pseudo-verbs. From a syntactic perspective, the negative particle *ma-* fills the position of the NegP when it negates perfect verbs. As a result, there is no need for the verb to raise to NegP and carry the negative particle to raise Asp. Furthermore, the discontinuous negation *ma-..... iʕ* fills the position of the NegP, the verb combines with head of NegP, they all finally raise to T.

**Keywords:** verbal negation, pseudo verbs, perfective, imperfective, discontinuous.

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## 1. Introduction

Negation is a universal phenomenon that is common to all languages of the world. It is hard to imagine that there is a natural language without a system of negation. “All human systems of communication contain a representation of negation.” (Horn, 2001, p.xiii). In every spoken language, we must use negation to express ourselves in various situations: or else it would have been very difficult to negate or deny our affirmative statements. Moreover, negation is one of the basic concepts of any language. Each language has its negative system that includes particles and negated elements. If all the languages had a similar system of negation, it would have been less difficult to learn a second language. Unfortunately, it is not the case. Each language has its own system of negation and expression.

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Arabic, a Semitic language, is one of the most wide-spread languages in North Africa and Southwest Asia. It is part of a language family that is officially called Afro Asiatic family (Ryding, 2005). The Jordanian dialect belongs to the so-called oriental dialects, along with the Syrian, Palestinian, Lebanese dialects.

Negation can be uttered in different ways that use various patterns across the varieties of Arabic. A lot of studies have been carried out on negation in Modern Standard Arabic (henceforth MSA) and other Arabic dialects from a morphosyntactic perspective, but there is still significant work to be done. The distribution of negative particles in verbal and nonverbal sentences has been investigated by many linguists (Sallakh, 2021, Al-Horais, 2017, Murphy, 2014, Al-Momani, 2011, Mousa, 2020). This paper aims to investigate the morphosyntactic properties of sentential negation in Rural Jordanian Arabic.

### Literature review

Negation in RJA is not as simple as other Arabic dialects. Benmamoun et al. (2013) reports that many Arabic dialects convey negation utilizing the circumfix morphemes *ma* and *-iš*. He claims that Moroccan Arabic and Egyptian Arabic use the enclitic *-iš* goes with the proclitic *ma*, but *-iš* is not used in other dialects, such as the Gulf varieties. He argues that the use of *-iš* in Levantine dialects differs some use it, and others use *ma* only.

Negation in Arabic varieties can be conveyed in different ways. The formation of negation in these varieties vary from those holding a sole negative marker such as Modern Standard Arabic as in (1), Gulf Arabic, Hijazi Arabic and Syrian Arabic, to those holding two negative markers (bipartite negation), such as Moroccan Arabic as in (2), Egyptian Arabic, Palestinian Arabic, Yemeni Arabic and so forth.

(1) a. *maa kataba Ali-un r-risala-t-a.* (MSA)

NEG wrote.3.M.SG Ali-NOM DEF-letter-3.F.SG-ACC

‘Ali did not write the letter.’

b. *maa Ali-un fi d-daar-i.*

NEG Ali-NOM in DEF-house-GEN

‘Ali is not in the house.’

(2) a. *Omar ma-ktəb-š lə-bra* (Moroccan Arabic)

Omar NEG-wrote.3.M.SG-NEG DEF-letter

‘Omar did not write the letter.’

b. *Omar ma-ši mriD*

Omar NEG-NEG Sick

‘Omar is not sick.’ (Benmamoun, 2000, p. 7)

Al-Momani (2011) investigates sentential negation in JA and argues that negative particles head their own functional projections. She shows that negation in JA takes place between TP and VP. Al-Momani claims that the negative particles *ma ...s* and *ma:* are used to negate copular sentences. Non-copular sentences, on

the other hand, are negated via using the negative particle *mis*. MSA, in comparison, uses different negation particles to negate copular sentences; it utilizes *ma* to negate past perfective forms, *lam* for the past imperfective, *lan* for the future and *lysa* for the present tense.

Murphy (2014) conducted a study on negation in Syrian Arabic at the clause, phrase and word levels. He argues that negation in Syrian Arabic is realized via a spectrum of lexical, morphological and analytical means. The varied set of negative particles used to encode negation in SA, he adds, is different than the rest of the Levant dialects. He claims that it is more closely related to Iraqi and Gulf Arabic. In his study, Murphy indicates that the negative particle *ma*: is used to negate copular sentences in SA, whereas the rest of the particles are used to negate non-verbal sentences. Negative particles such as *bidu:n*, *bala*, *mu:*, *mendu:n*, and many more are used to negate nouns, adjectives, prepositional phrases, participles and question Tags. They are also used for discourse and pragmatic emphasis. *la:*, on the other hand, is used for emphatic negation which is explored in depth in his work. However, contrary to what Murphy claims, many of the words used to express lexical negation in SA are also commonly used in JA and other Levantine Arabic dialects( Lebanese, Palestinian and Jordanian).

Mousa (2020) in a paper on sentential negation in Rural Palestinian Arabic reports that negation in RPA is morphosyntactically similar to negation in Modern Standard Arabic. His study indicates that the negative markers *ma* and *is* are used for negating both perfective and imperfective verbs, whereas *mus* is used for negating nominal and non-verbal predicates functioning as a head element of the NegP. He further explains that the post verbal negative particle *-is* is not as common in Urban Palestinian Arabic.

Negation in RJA has different variations; various methods can be applied to negate imperfect and perfect verb. The particle *ma* comes before the verb to negate perfective and imperfective verbs; by *ma....-iš*, *ma* procliticizes and *-iš* encliticizes to the verb. The particle *miš* is used to negate nominal, adjectival, participle, and prepositional predicates. It is also used to negate imperative/prohibitive verbs. The negative particle *la* is used to negate

imperative/prohibitive verbs and nominals.. The focus in this paper will be on verbal negation where pre-verbal negative particle *ma*, the post verbal negative particle *-iš* and the discontinuous negative particle *ma....-iš* are used.

### 1.1 The Negative Morphemes *ma*, *ma....iš*, and *iš*

The discontinuous negative morphemes *ma....-iš*, and *-iš* are similarly used for both perfective and imperfective verbs, as shown in (3) -(5). We express the negation of an imperfective verb by using *ma* (3), *ma....-iš* (4), or *-iš* (5). The imperfective verbs start with *b-*, to reveal imperfective aspect. It is important to mention that the use of *ma* with imperfective verbs is not a must as shown in (5).

(3) **ma**-ba-naam

NEG-ASP- sleep.1SG

‘I don’t sleep.’

(4) **ma**-ba-naam-**iš**

NEG-ASP- sleep.1SG-NEG



‘Don’t play with them.’

According to Palva (1984), prohibitive verbs are different from the imperfective verbs. The prefix b- is attached to imperfective verbs, whereas t- prefix is attached to prohibitive verbs to mark second masculine in imperfective verbs. The particle –iš can be attached to the object clitic in verbs in RJA as it is shown in (12). The particle –š is attached to the object pronoun –ha.

- (12) **ma-šofit-ha-š**                      ha-l-bent  
 NEG-saw.1SG-her-NEG this-the-girl  
 ‘I didn’t see this girl.’

### **The case of the prepositions *šind* (at - have), and *maš* (with -have) in RJA**

Arab grammarians do not agree on a certain definition of prepositions. One of these definitions is that prepositions are a subcategory of particles and particles as “words that do not have a meaning in themselves, but that have a linking function with other parts of speech” (Louchane, 2006:11). Heine (1997) states that the mapping between location as a source schema that is extended to function as have-constructions is a well-established pattern of grammaticalization. Moreover, Rubin (2004) claims that such change can be found cross-linguistically and is attested in Arabic in both MSA and cross-dialectal. The preposition *šind* ‘at’ shows how a locative preposition is used to display the abstract field of possession. RJA as an Arabic dialect uses both functions, as a preposition and as a verb to express possession (pseudo verb), shown in (13) and (14).

- (13) Al-ħaadeth Sa:r *šind* Id-dactoor  
 DEF-accident happen-v2 at DEF-doctor  
 ‘The accident happened at the doctor’

- (14) *šindi* beit  
 with-me house  
 ‘I have a house’

It is obvious that the preposition *maš* ‘with’ wins a new function in addition to its main prepositional function. The additional use is very resembling in nature to the new function used by *šind* as in (15) and (16) which show the dual function of *maš*.

- (15) Ana ruħit *maš* Ali  
 1<sup>st</sup> p-I went-v2 with Ali  
 ‘I went with Ali’

- (16) *maši* maSa:ry  
 With-me money  
 ‘I have money’

It is worth mentioning that *maʕ* and *ʕind* cannot be used interchangeably because they are semantically different. It has been noticed that *ʕind* describes a “general possession” whereas *maʕ* “refers to immediate possession”. (Thackston 1996:40 cited in Rubin 2004:87)

Regarding the negation of the pseudo-verbs *maʕ* and *ʕind*, they are deemed non-verbal negation, which are prepositional phrases and adverbials that act like verbs. Arabic varieties speakers who use discontinuous negation *ma... iʕ* constantly with verbal predicates deal with pseudo-verbs the same way as standard verbs by the discontinuous negation, *ma... iʕ*. We have three negative patterns regarding pseudo- verbs: *ma* can be used as an independent particle (17), both *ma-* as proclitic and *-iʕ* as an enclitic (18). With *ʕind* RJA speakers allow either the preverbal or the discontinuous negation, *ma... iʕ*. The postverbal is ill-formed.

(17) **ma** *ʕind-i:*                    *beit*  
 NEG with-me house  
 ‘I don’t have a house.’

(18) **ma-ʕind-i:-ʕ**                    *beit*  
 NEG-with-me-NEG house  
 ‘I don’t have a house.’

Using *-iʕ* by itself as an enclitic is considered ungrammatical in the negation of the pseudo-verb *ʕind* ‘at/have’. This can be illustrated in (19).

(19) \* *ʕind-i:-ʕ* *beit*  
 at-me-NEG a house.

With *maʕ* RJA speakers use the three alternatives as in (20) -(22)

(20) **ma-ʕi:-ʕ**                    *maSa:ri*  
 with-me-NEG money  
 ‘I don’t have money.’

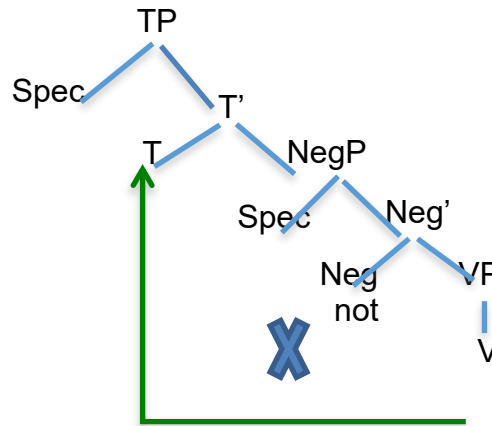
(21) **ma- ma-ʕi:-ʕ**                    *maSa:ri*  
 NEG-with-me-NEG money  
 ‘I don’t have money’

(22) **ma- ma-ʕi**                    *maSa:ri*  
 NEG-with-me- money  
 ‘I don’t have money’

## 2. Discussion

In this part, we are going to present the syntactic interpretation of negation and the partition of the negative morphemes in RJA. The NegP Hypothesis of Chomsky (1995), Benmamoun (1992), Shlonsky (1997), Ouhalla (1991), among many others, has been adopted in most of the studies on sentential negation in Arabic dialects. The hypothesis states that negative morphemes head their functional projection located between the tense and the verb. Benmamoun et al. (2013, p.85) state “grammatical categories such as tense

and negation occupy syntactic projections above the lexical categories that contain the thematic head and its associated arguments”. This can be illustrated in the following Tree.



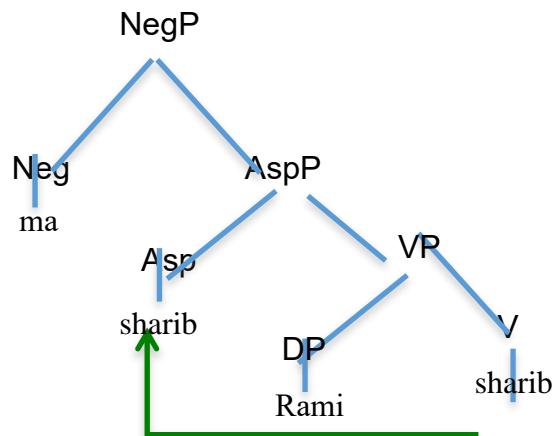
Benmamoun (2000) states that the negative particle in Jordanian Arabic is a head element and it heads its own syntactic projection; sentential negation occupies the position between TP and VP.

### 3.1 The Negative Particles *ma*, *ma-š*, *-iš*

Let’s begin by analyzing the syntax of verbal negation spotlighting on *ma* in the perfect tense as shown below.

- (6) **ma** širib                      Rami  
       NEG drank. 3SG.M        Rami  
       ‘Rami didn’t drink.’

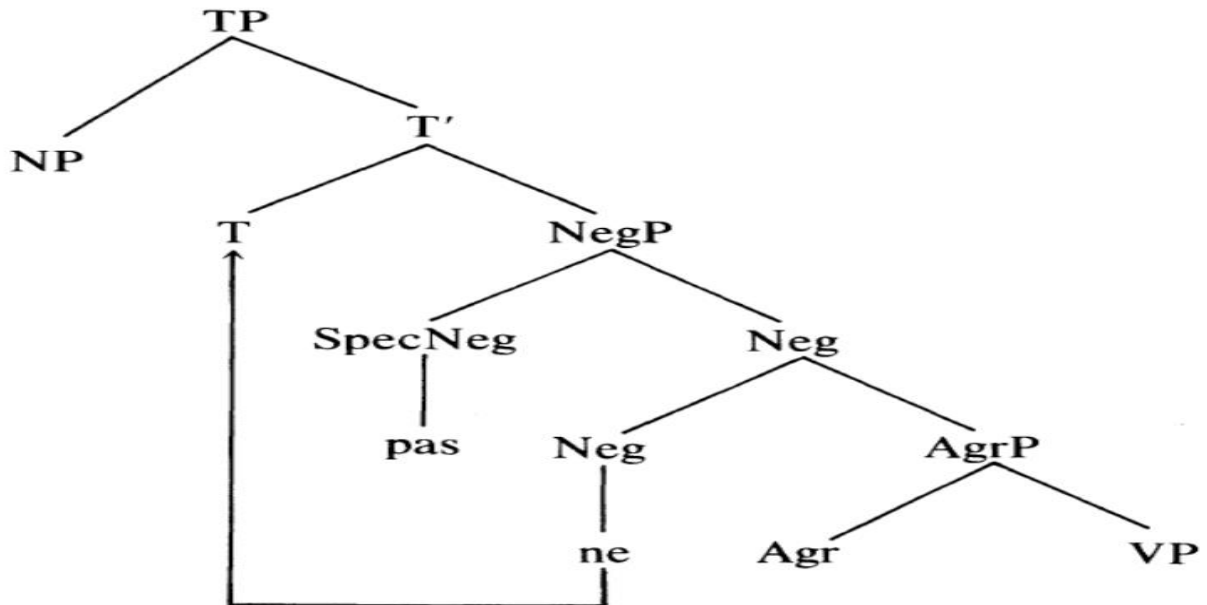
Ouhalla (1993), Benmamoun (2000), Bahloul (1996), and Aoun et al. (2010) explain that *ma* the head of NegP is used for sentential negation in various Arabic dialects in both perfective and imperfective verbs. Thus, this sentential negation abides in a place between TP and VP. The verb does not need to be cliticized to the separate negation particle. Consequently, the verb does not need to raise to NegP to pick up the negative particle, rather than raises to Asp, as illustrated in the following tree.



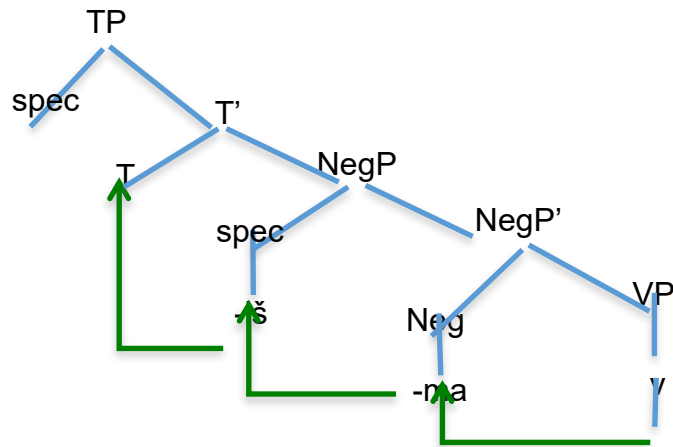
The negative particle *ma... iš* acts differently according to the aspect. *ma... iš* or *ma* can be used if the verb is perfective. Like other Arabic dialects, the use of *iš* alone is not possible in RJA. However, the other three variants are possible if the verb is in the imperfective form as previously mentioned (vowel syncope applies to the imperfective verb *širib* (drink) and similar forms when both particles are used).

- (7) **ma širib-iš**                      Rami  
 NEG-drink. 3SG.M -NEG Rami  
 ‘Rami did not drink.’

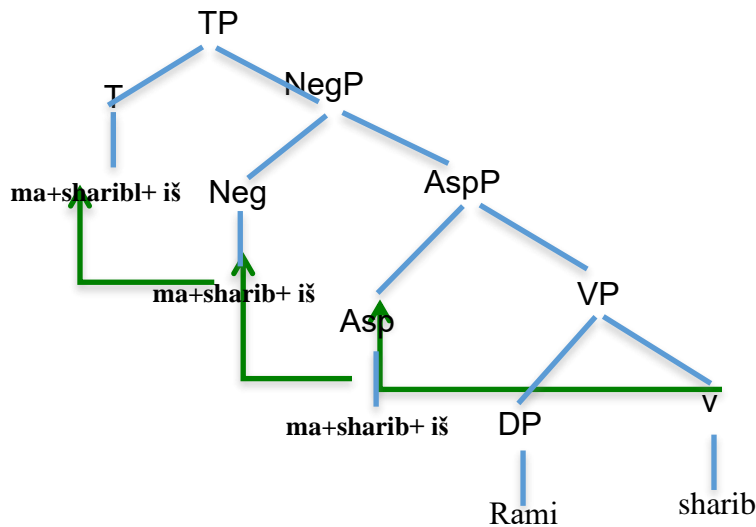
Regarding the syntactic analysis of the discontinuous negation, on the one hand, the controversial use of *ma... iš* in some variations is considered an adverb like the *pas* in French (Lucas, 2007). Pollock (1989) investigated the French negative particle from the viewpoint of verb movement. She supposes that *ne* is typically the head of the French NegP, with *pas* its typical specifier with finite verbs. Moreover, she claims that the negative particle can be in the adverbial position in VP initial position, with *ne* as a head. Finally, she states that *ne* can also be the head of a negative NP generated in an A-position. Consider the following tree diagram taken from (Pollock, 1989: 414)



On the other hand, Benmamoun (1992), Ouhalla (1993) and Shlonsky (1997) claim that *-iš* occupies Spec of NegP and *ma-* occupies the head. Therefore, the verb raises to Neg before raising to T; the proclitic *ma-* cliticizes to the verb and then raises to pick up the enclitic *-iš* and then raise together to T. Consider the following tree diagram.



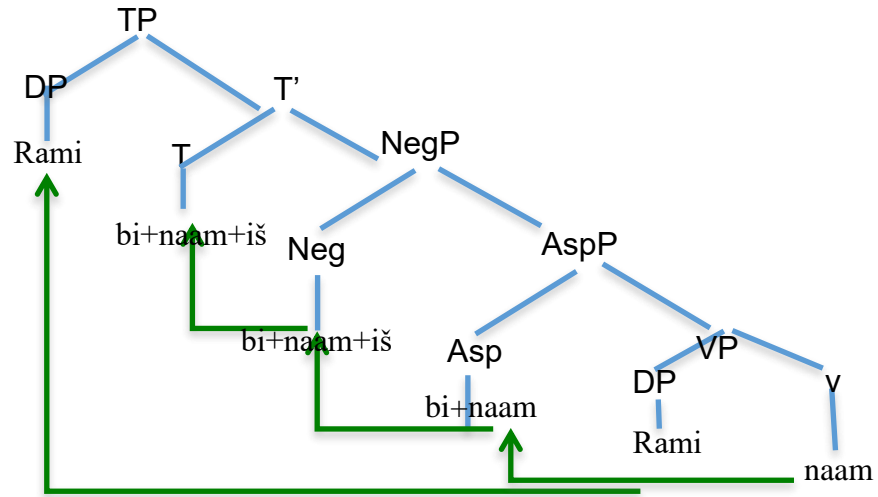
Benmamoun (2000) claims that both *ma-* and *-iš* can be the head of *NegP*. Therefore, because of minimality, the verb cannot pass the *Neg* head and raise to *T*. Thus, it must merge with the *Neg* head to check the +D feature and then raise to *T* to check the +V feature. Respectively, the subject and verb occupy *Spec* of *VP* and *V*. The following tree diagram shows that the perfect tense negation in RJA might also be indicated by using the discontinuous negative, *ma-* as a verbal proclitic and *-iš* as a verbal enclitic. Consider the following tree diagram:



The use of both *ma-...-iš* is more common in RJA. However, the use of negative enclitic *-iš* is not a must. *iř* is mostly used because the stress falls on it. A good piece of evidence to support the claim that *-iš* must occupy the head of *NegP* is that we cannot encliticize the perfective aspect by *-iš* without the proclitic *ma*, while we can do with imperfective aspect. Consider the following repeated example to illustrate this notion via the tree diagram.

- (5) Rami bi-naam-*iř*  
 Rami ASP-sleep.1SG-NEG  
 ‘Rami doesn’t sleep.’





As discussed earlier, *maʕ* and *ʕind* can act as prepositions. Therefore, they can be part of a prepositional phrase. Consider the repeated examples (13) and (15), where *ʕind* and *maʕ* are used as locative prepositions. *ʕind* and *maʕ* can also be used as temporal prepositions like when we say, [*ʕind al-fajer*] ‘at dawn’/ [*maʕ al-yroob*] ‘at sunset’.

(13) Al-ħaadeth Saar **ʕind** Id-dactoor

DEF-accident happen-v2 at DEF-doctor

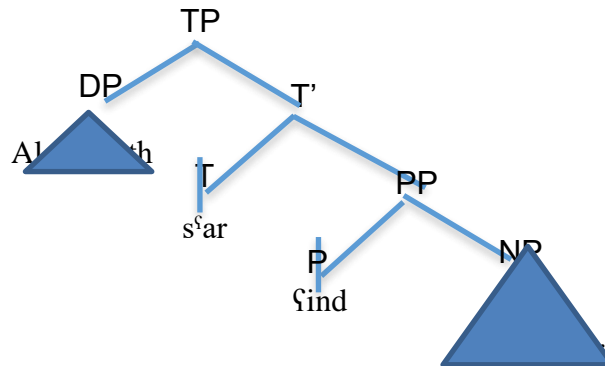
‘The accident happened at the doctor’

(15) Ani ruhit **maʕ** Ali

1st p-I went-v2 with Ali

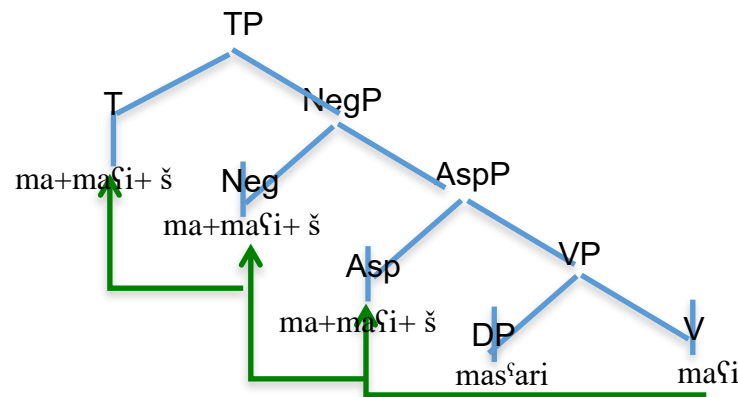
‘I went with Ali’

This can be shown in the following tree diagram:



As far as negation is concerned, we can claim that *maʕ* and *ʕind* behave exactly like verbs. They must merge with negation. Pseudo-verbs are negated in the same way as standard verbs and auxiliaries. Consider the following repeated example (21) and the tree diagram that follows:

- (21)    *ma- ma-ʕi:-š*                    *maʕari*  
           NEG-with-me-NEG money  
           ‘I don’t have money’



### 3. Conclusion

This paper investigated the negation of verbal sentences in RJA. It revealed that the distribution of negation differs depending on the position of the negative particles in addition to the negated element. There are different negation strategies in RJA. We use the negative particle *ma-...-iš* in the perfective and imperfective aspect. Omitting the part of the negative particle *ma-...-iš* depends on the verb type. Only *ma* or *ma-...-iš* is acceptable in perfective aspect. Using either affix or both together is possible and acceptable in imperfective aspect. As a conclusion, the optional negative suffix *-iš* can be used on its own with all verbs and pseudo-verbs that are negated with *ma-* except perfective verbs and the pseudo-verb *ʕind*.

Brusted (2000) tenders that the omitting of *-iš* indicates emphasis or absolute negation. Syntactically speaking, when *ma* is used in perfect aspect, it occupies the head of NegP. Thus, the verb does not need to raise to NegP to pick up the negative particle and raise to Asp. However, when *ma-...-iš* occupies the head of NegP, the verb merges with NegP head then they all raise to T. Finally, in the presence of pseudo-verbs, the use of *ma-...-iš* is more common. Moreover, they share verb-like features with the class of verbs in RJA.

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## **Intelligent Territory Focused On The Transportation Sector In Sugamuxi Province**

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**Abstract**

Sogamoso has an important geographic position at the national level as it is a municipality of origin and destination that connects the center with the east of the country. It is characterized as a municipality whose sources of employment are mainly agriculture, industry, and commerce, so the population tends to increase and require public transportation services. It is important to highlight that both Sogamoso and its surrounding municipalities have tourist areas such as Paramos, the Tota lagoon, the bio park, and thermal wells, among other attractions; however, tourism is inferior to other territories in the country. Its competitiveness is affected by existing shortcomings in the municipality, one of which is the quality of public transportation and the little information that tourists can obtain about it. Thanks to current technological advances, a new concept is emerging in public policies called an intelligent territory, which consists of increasing sustainable development and generating strategies for collective growth and progress in the territories supported by technology. To provide improvements in the sector, the creation of an intelligent territory is proposed, supported by technological advances and the collection of accurate and timely information focused on the public transportation sector, since mobility is a fundamental factor that allows citizens to move from their homes to their jobs and studies, and tourists to access the areas and tourist attractions that each municipality has, becoming an important element in the quality of life of a community and the economic growth of the municipality.

**Keywords:** Intelligent Territory, Transportation

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### **1. Introduction**

In search of development, sustainability, and inclusion, a new modality is incorporated into the public policy model that reduces bureaucratization in public decision-making, which is based on the constitution of intelligent territories (IT),

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current technology has been a great ally in the construction of IT in the globalized world, so the idea of building IT has increased in developed and underdeveloped countries. Cities like Tokyo, New York, Singapore, and Barcelona are at the forefront of the different areas of activity related to a Smart City. The benefits of a Smart City include improved environmental quality, urban mobility, security, education, health, economy, and government. IT is understood as those innovative cities capable of building their competitive advantages concerning their environment, seeking a balance between the aspects of economic competitiveness, social cohesion, and sustainability, regardless of their size, with people and technology as the main focus (A., 2016)

Paskaleva (2011) proposes a multidimensional approach that integrates factors such as infrastructure, the physical and environmental setting, social characteristics, and economic potential. Secondly, the smart territory approach is based on the consideration of innovation and knowledge as fundamental pillars in the growth of territories, as well as on the definition of a strategic vision oriented toward competitiveness. Finally, in all definitions, the implementation of technological platforms is considered, to a greater or lesser extent, as a transversal axis of the different urban spheres (Vega Jurado, 2018).

According to the Maturity Model proposed by David Hammer in 2007, to create a territory or smart city, a fundamental factor is the use of information, as it is well known that information is effective when it is time for decision making and allows to highlight the problems to find the right solutions, based on the analysis of the information collected, focusing its actions always in search of sustainability and inclusion, oriented to the fulfillment of challenges and expectations of the people who inhabit it to ensure the common welfare, generate an environment of collaboration, innovation, and permanent communication with all the actors and institutions that compose it (National Planning Department [DNP], 2020), being of great importance the technological advances in the development, growth, and generation of wealth, supported in the era of industrial production reaches a higher level of economic welfare generating more job opportunities and benefits in education. Thanks to this and due to the existence of universities and institutes of higher education more population tend to move to the municipality, increasing the volume of inhabitants, which leads to new challenges in terms of mobility which the municipality has not managed to meet efficiently since according to censuses conducted by DANE 2018 the population in Sogamoso is 120.462 and taking into account that a percentage of the population migrates from their municipalities of origin temporarily to access higher education offered, which increases the demand for public transportation service. In addition to this, the municipality and surrounding municipalities do not give due importance to tourism, taking into account that they have a large number of attractions and tourist areas that if taken advantage of to attract the attention of tourists can generate greater economic development, so taking advantage of these tourist resources also increases the need for improvements in public transportation services that allow citizens to travel to their workplaces and homes, and the access of tourists to tourist areas and attractions, but without neglecting the fact that transportation costs must be affordable for the population, which means a change in the appreciation of urban centers associated with ideas of chaos, disorder, noise, and pollution (Echavarría Ochoa, n. d.).

Citizens' perception of these technological changes varies in very significant ways depending on the field of action in question. As a general rule, and regardless of the economy, transport is one of the aspects that most concern citizens, reducing transport time and costs, avoiding traffic jams and incidents en route, and maintaining a healthy lifestyle. Therefore, the transportation sector is a

transcendental axis in the creation of intelligent territories, for the opportunities and strengths that it allows in the development of other economic sectors; since it expands the competitiveness of the municipality at the national level. Sogamoso and its surroundings present great strengths in the tourism sector since they are territories with beautiful attractions.

In search of improvements for the sector, information is required to make the right decisions with a focus on public transportation service, to achieve an accessible service that provides sufficient information, providing ease to the tourist when visiting the municipality, and thus strengthen the economy and increase the quality of life and opportunities of the inhabitants relying on innovation, application and use of new technologies.

## **2. Objectives**

### **2.1 General objective**

Create an intelligent territory in the municipality of Sogamoso focused on the transportation sector.

### **2.2 Specific objectives**

- Evaluate how the constitution of a smart territory focused on the transportation sector benefits the improvement of the quality of life of the community.
- Identify what opportunities the strengthening of the transportation sector represents for the constitution of a smart territory in the municipality of Sogamoso.
- Establish a methodology for the implementation of an intelligent territory focused on the transportation sector.

## **3. Methodology**

### **3.1 Focus of the study**

#### **3.1.1 Mix**

The approach of the study was mixed since data were analyzed and for this purpose, the quantitative method was taken into account at the time of statistical analysis through surveys and tabulation of information, then the results were analyzed through the qualitative method for strengthening the transport sector through the proposal of an intelligent territory, to provide a database that subsequently allows the creation of an application that will increase the opportunities of the potential sectors of the municipality.

### **3.2 Method of study**

#### **3.2.1 Deductive**

The data analysis was carried out through the deductive method, based on the maturity model for smart cities and territories, taking into account the dimensions proposed therein, strategies are proposed for the constitution of a smart territory with some municipalities of the Sugamuxi province.

### **3.3 Type of study**

#### **3.3.1 Descriptive**

This research has a descriptive approach since it analyzes and describes the opportunities and strengths of the tourism sector in Sogamoso and some municipalities of the Sugamuxi province and the advantages of implementing an improvement in the transportation sector through a proposal with the application of technologies and innovation oriented to the construction of an intelligent territory.

For this purpose, the information collected through methods such as information gathering, observation, community interviews, and documents and references about the topic are taken into account to obtain conclusions based on the information collected.

### **3.4 Sources and techniques of data collection**

#### **3.4.1 Primary sources**

**The primary sources used in this project were:**

- Information provided by officials of the Sogamoso Transportation Terminal.
- Information provided by public transportation service officials: urban buses, cabs, and inter-municipal buses.
- Surveys of users and service providers.

#### **3.4.2 Secondary sources**

Departmental and municipal national development plans, Ministry of Transportation, DANE, Sogamoso transportation terminal page, laws, theories, books, magazines, references of intelligent territories constituted.

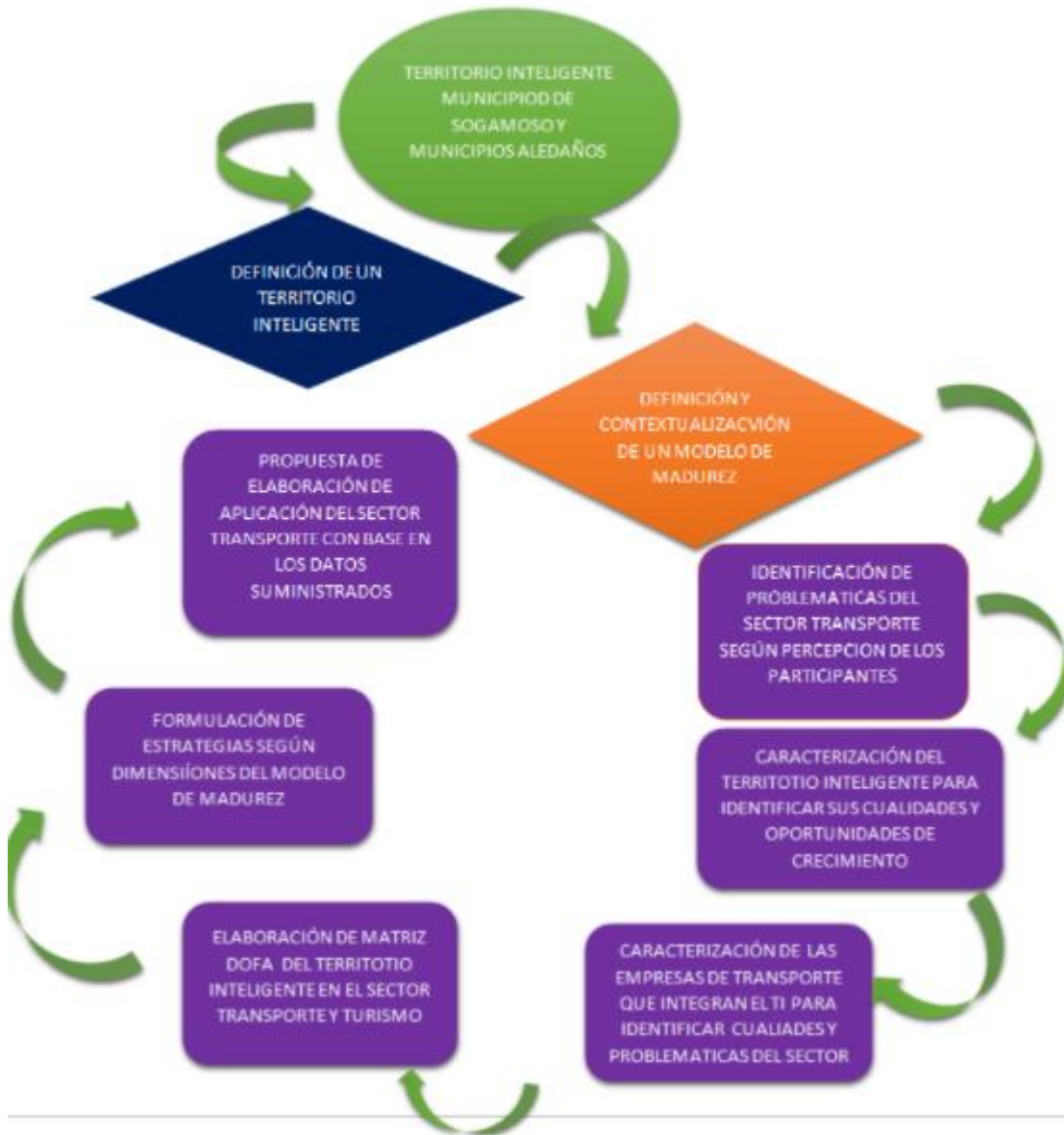
### **3.5 Population and sample**

The affected population is:

- Users of the public transport service in Sogamoso
- Providers of the service of public transport for passengers in Sogamoso.

## **4. Results**

### **4.1 Intelligent Territory in the Municipality of Sogamoso**



**Figure 1.** Process cycle for the smart territory proposal in Sogamoso.

**Source:** Own elaboration

#### 4.1.1 Intelligent territory

When talking about intelligent territory, it is necessary to start by knowing about territorial development understood as a process of the social construction of the environment, driven by individual and collective initiatives of different actors and the operation of economic, technological, socio-political, cultural, and environmental forces in the territory, also including characteristics related to innovation, an example of this is the case of Medellín that through technological implementations in different areas. This has allowed improving the quality of life of its inhabitants, establishing a metropolitan transportation system that allows access of the entire population to vulnerable and remote areas, in addition to the creation of the MEDATA platform that consolidates the information in the open data format of the municipal administration of Medellín, these among



other contributions, earned Medellín an important recognition in the second edition of the World Smart Cities Awards, (World Smart Cities Awards), in Barcelona.

For the development of the smart territory proposal in Sogamoso, its weaknesses, strengths, threats, and opportunities will be studied for an analysis of the municipalities that will integrate it, identifying the capacities it may have to increase the economic development of the municipalities, which implies learning from the experience of other territories and from the own experience to identify a smart profile about its context.

Other characteristics refer to the connections with networks and cities, so it is proposed the union of 6 geographically close municipalities that complement each other by their economic sources, such as Sogamoso and Nobsa that are characterized by their main sources of employment based on the steel and manufacturing industry, Iza, and Tibasosa are characterized by their gastronomic variety such as desserts, sweets, and typical drinks like sabajón and chicha, Aquitania and Tota are characterized by their onion crops and trout farms. These municipalities have the potential to form a tourist ring because they have natural parks, paramos, lagoons, thermal wells, ecological trails, biodiversity, and historical tourism, which allows for better regional operations through cooperation and harmonious relations at the local, regional, and national levels.

On the other hand, the introduction of technology to the transportation service is intended to create an application focused on the public transportation sector, which allows consolidating the necessary information and facilitates its use, contributing to the improvement of the quality of life of the inhabitants, since it promotes the use of collective transportation, reducing the emission of polluting gases, vehicular congestion, and the reduction of waiting times for the service since the use of private vehicles is reduced. Taking into account that, from the point of view of environmental sustainability, IT is characterized by urban development models based on the valuation and preservation of the environment and renewable resources.

On the other hand, it is important to clarify that the concept of a smart city or territory is still in a primary stage, although there are plans and policies to create smart systems and services and to improve the telecommunications infrastructure, there is still no consolidated effort to create a smart city and there are weaknesses in the formulation of projects and the articulation with the productive and economic sectors of the territory, highlighting the use of technology as a means to improve people's quality of life, through the efficient use of information for better management of resources directed to the provision of public services, investment in human development, reduction of environmental impact, promotion of new forms of governance, and therefore, contribute to the sustainable development of the city.

In conclusion, a territory is economically sustainable when its competitiveness is determined by innovation, appropriation, knowledge diffusion, creativity, and the talent of its citizens, which allows competitive advantages at a global level. It is important to clarify that any city or municipality, regardless of its size and level of infrastructure, can be a smart territory.



**Figure 2.** Triangle of economic, social, and environmental sustainability.

**Source:** Taken from Smart territory and creative economy space: a first conceptual and practical research approach.

## 4.2 Analysis of participants' perception of the public transportation service in the municipality of Sogamoso

To describe the current conditions of public transportation in the municipality of Sogamoso, surveys were structured and applied to both service providers and users, to determine the perception of the sector's participants in terms of expectations and problems that currently arise in the provision of the service.

### 4.2.1 User survey

The population to be surveyed for the development of the objectives of the proposal for the constitution of an intelligent territory in the municipality of Sogamoso is 164 users of the public transportation service to know how the transportation service benefits the tourism sector of the territory; based on the application of simple random sampling with infinite population because the amount of population that enters the municipality as a visitor is uncertain, applying a confidence level of 80%, a probability of occurrence of 50% and a margin of error of 5%.

As a result of the surveys conducted, the population was classified according to gender and age, and it was determined that 37.5% are men and 62.5% are women, with a tendency to be higher among people between 21 and 25 years of age.

In terms of the time needed to travel to their destinations, 35.7% take less than 15 minutes and 35.7% take between 15 and 30 minutes. This is since Sogamoso is a municipality with a small territorial extension so the work and study sites are close, being urban transportation with 43% the most used means of transportation by users, 7% walking because of the proximity of their path, also 19% opt for the use of bicycles which is a good option because it is a sustainable and environmentally friendly means of transportation.

Regarding the provision of cab service, 56 people surveyed gave a rating of 7 on a scale of 1 to 10, and of the service provided by the buses within the municipality of Sogamoso 42 users gave a rating of 6 on a scale of 1 to 10, 42 people assigned a rating of 5, regarding the provision of public service users considered that the most important aspects are: punctuality, safety, and price, they also think that other aspects could be improved such as the implementation of new routes and schedules, modernization of vehicles, regulate the collection in cab services, extension of night bus schedules and better attention and tolerance towards users.

Regarding the contribution of public transportation to the tourism sector of the territory, users believe that it is an economical option when traveling since several people can go in the same vehicle, minimizing costs. 52.4% of people do not have a preference for a transportation company when traveling outside the municipality, allowing transportation companies to provide added value to build user loyalty. However, the remaining population prefers the Libertadores and Concorde companies for long distances such as the Sogamoso-Bogotá route, due to their price and quality, while for short distances, users prefer the Cootracer company.

Currently, the use of mobile technologies and applications has increased, however, 92.7% of the users do not use the existing applications of the transportation service, however, 92.7% of the users would use an application that is efficient and contributes to the improvement in the provision of public service.

Being one of the main purposes of an intelligent territory the improvement of the quality of life of the people, supported by technology, which allows outlining sustainable projects, through these it is sought to scale in the economic, social, and environmental development; taking into account the response of the users it was concluded that most of the users have knowledge of the main purpose of an intelligent territory, despite being a recent term and that it has been promoted in the country for a short time.

#### **4.2.2 Survey of public service drivers**

The target population to be surveyed for the development of the objectives of the proposal for the constitution of an intelligent territory in the municipality of Sogamoso is 143 people based on the application of simple random sampling with a finite population since the population providing transportation services is a defined number of people, applying a confidence level of 80%, a probability of occurrence of 50% and a margin of error of 5%.

In terms of gender, it was determined that 95% of the surveyed population of public transport service providers are men and only 5% are women, with the highest average age being between 35 and 50 years old.

It was found that 66.7% of the surveyed population spend less than 15 minutes to reach their destination. 7% spend less than 15 minutes to get to their destination because most of the drivers park their vehicles at their place of residence and 16.7% use bicycles, showing the need to adapt bicycle routes in the municipality. In addition, regarding the quality of the cab service, 36 people assigned a score of 7, which is the highest score assigned by drivers, and 2 people gave a score of 1, which is the lowest for this service; while in the provision of the service in urban transportation buses, 47 transporters gave a rating of 5 on a scale of 1 to 10 being this the score chosen by most people and 12 people rated it at 1. It can therefore be concluded that the service providers are aware that the service has several shortcomings and believe that the responsibility of the driver, attention to the user, cleanliness, safety, punctuality, and routes are very important aspects of good service provision, and consider the price to be less relevant, availability and schedules, taking into account that the perception of those who provide the service is based on the fact that the price is low, for some routes and the costs incurred at the time of providing the service, in addition, cab drivers consider that the fares are not reasonable for some routes.

91.7% of the drivers consider that public transportation contributes to the growth of the tourism sector of the territory since they believe that the cab service is the primary transportation for tourists who do not have a private vehicle, in addition, the person providing the service can guide tourists and inform them about the culture and all the qualities that the area can offer, thus improving the quality of service and encouraging the use of public transportation by visitors.

Despite the existence of different applications that facilitate the provision of the service, most drivers do not make use of them because it is difficult to use and there is no cost-benefit relationship, however, 58.3% would use an application that consolidates the information of the transport service as this would facilitate the service to be provided in a more agile way, allowing for greater interaction with users.

Most drivers do not know an intelligent territory, so training would be required to provide the necessary information on the benefits of IT, which would encourage a greater influx of tourists.

Based on these surveys it can be concluded that in general, the users do not consider that the service provider has the optimum quality and fully satisfies their needs, noting that several shortcomings are established in the service not only by the perception of the users but also by the drivers since it is aware that in many occasions an adequate, respectful and responsible attention is not given to the user. It is also evident that there is a deficiency in terms of adequate infrastructure of bicycle routes that cover the need to protect cyclists, since it is the most sustainable means of transportation in the municipality and provides the opportunity to reduce costs to citizens, in addition to allowing the decongestion of vehicles in the municipality.

#### **4.3 Characterization of the Municipalities that will constitute the Intelligent Territory**

The province of Sugamuxi- Is located in the northeast of the department of Boyacá, with a territorial extension of 2456 km<sup>2</sup>, corresponding to 14.4% of the total area of Boyacá. It borders to the north with the provinces of Tundama and Valderrama, to the south with part of the province of Lengupá and with the department of Casanare; to the east, with part of the province of Valderrama, with Casanare and closes to the west with the province of the north. Sogamoso is its capital; the municipalities of Tópaga, Mongui, Mongua, Aquitania, Cuítiva, Firavitoba Nobsa, Gámeza, Iza,

Tibasosa, Pesca, and Tota are also part of the region. The predominant economic activities are livestock, agriculture, mining, handicrafts, industry, and commerce.

The main productive sectors are the industry and the service sector. The primary sector is also of great importance as it provides the production and extraction of natural resources necessary for industrial production. It is important to highlight Tota Lake as a strategic area of high environmental and tourist importance for the province.

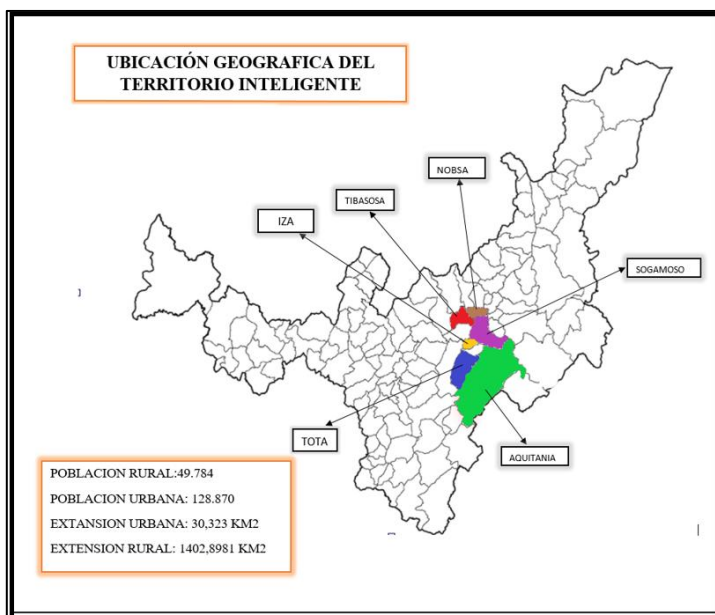
It has a total population of 197,346 inhabitants (DANE, 2018) equivalent to 16.9% of the departmental population and 0.41% of the national population, which means a population density in the province of 81 people per km<sup>2</sup> being Sogamoso one of 10 municipalities with the highest population concentration.

([https://www.dapboyaca.gov.co/wp-content/uploads/2020/07/PDD\\_version\\_web\\_Final.pdf](https://www.dapboyaca.gov.co/wp-content/uploads/2020/07/PDD_version_web_Final.pdf))

To increase the sustainable development of the territory, the proposal is established to constitute the municipality of Sogamoso as an intelligent territory in union with 5 municipalities belonging to the province, since regionalization is sought, i.e., the union of the municipalities in search of the same purpose, the main purpose being the improvement in the transportation service and the strengthening of tourism in these municipalities.

For the development of the intelligent territory, a previous study of the municipalities of the province was taken into account for the constitution of a metropolitan area in which it is established that the participants selected for their demographic and population characteristics, territorial extension, customs, and tourism potential, among other qualities, will be Sogamoso, Tibasosa, Nobsa, Aquitania, Tota, and Pesca, in which the municipality of Pesca does not show interest in forming a metropolitan area or union with the other municipalities since it is considered at a disadvantage with the selected municipalities, so for the constitution of the intelligent territory, the municipality of Iza is included since it represents great benefits for its tourism potential and its geographical location between Sogamoso and Aquitania, being a municipality of great importance for the improvement of the transportation service thought in the tourism increase of the territory.

These municipalities have a total of 166,470 inhabitants, equivalent to 84.3% of the total population of the province, with a greater number of people in the municipality of Sogamoso, which shows that the population tends to move to larger cities for work and study opportunities.



**Figure 3.** Geographical location of municipalities in the intelligent territory

**Source:** Own elaboration

Sogamoso, recognized for its commercial potential and mining possibilities, has a cultural heritage, with an important pre-Hispanic legacy and a history of blood by contributing to the formation of our Republic, is today a growing city that, given its consolidation as a territorial center, should strive for the recovery of its cultural heritage as a criterion for the construction of a city that is a Land of Blessings and monuments of heritage interest.

#### 4.4 Demographics of the Smart Territory municipalities

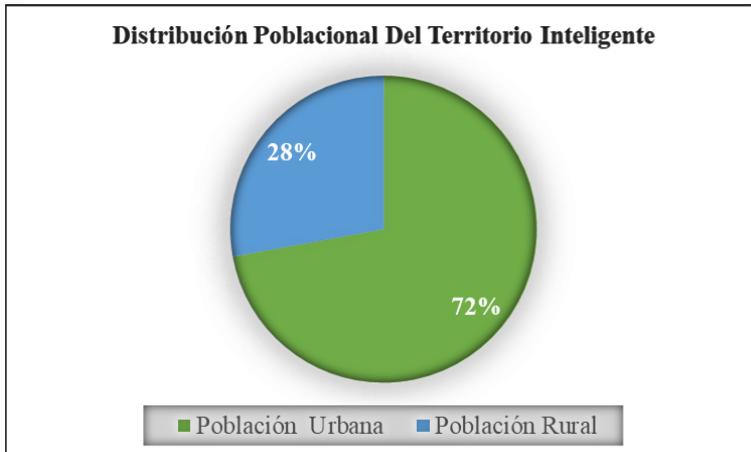
Municipio	Población Urbana		Población Rural		Población Total	Grado De Urbanización
	Población	Porcentaje	Población	Porcentaje		
Aquitania	5777	41.68%	9600	69.26%	13860	41.68%
Iza	1160	59.67%	787	40.48%	1944	59.67%
Nobsa	5026	34.30%	10950	74.74%	14651	34.30%
Sogamoso	111815	92.82%	15420	12.80%	120462	92.82%
Tibasosa	4238	38.45%	8702	78.94%	11023	38.45%
Tota	854	18.85%	4325	95.47%	4530	18.85%
Territorio Inteligente	128870	77.41%	49784	29.91%	166470	77.41%

**Table 1.** Population distribution by area

**Source:** Own elaboration According to data yielded by DANE- SISPRO- MSPS, 2018.

The degree of urbanization of the territory is 77.41%, noting that of the 6 municipalities the only municipality with more than 50% of the population located in the urban area is Sogamoso with

92.82% and the municipality with the highest rural population is tota with 95.47% of its inhabitants, (taking as a basis the population adjusted by coverage census in 2018 which is 7% of the total population) so it is evident that the degree of urbanization is so high thanks to the fact that the majority of the population is located in the municipality of Sogamoso.



**Figure 4.** Population distribution of the Intelligent Territory

Source: Own elaboration

#### 4.4.1 Demographic Indicators

Taking into account that the demographic study can determine changes in the volume and structural characteristics of the population and that by conducting demographic studies, results can be obtained at the level of structural phenomena at social, economic, historical, and cultural levels (INTRODUCTION TO DEMOGRAPHY).

Therefore, for the smart territory proposal in the municipality of Sogamoso, the latest birth, mortality, and population growth projection figures of the six municipalities that are proposed in the smart territory will be taken into account, considering the information of the last population census carried out in 2018.

Municipio	Natalidad (indicador por cada 1000 habitantes)	Mortalidad (indicador por cada 1000 habitantes)	Proyeccion Crecimiento Poblacional (Periodo 2018-2035)
Sogamoso	12,84 - año 2018	5,89 - año 2018	147.337 Habitantes
Tota	15,5- año 2018	6,59 - año2017	5.703 Habitantes
Iza	8,1 - año2017	5,03 - año2017	2.215 Habitantes
Tibasosa	8,35 - año 2018	4,42 - año 2018	14682 Habitantes
Nobsa	9,89- año 2018	3,39 - año 2018	18.049 Habitantes
Aquitania	13,40- año 2018	6,06 - año 2018	17.033 Habitantes

**Table 2.** Main Demographic Indicators

Source: Own elaboration According to data provided by DANE- SISPRO- MSPS, 2018

For Colombia and Latin America, there is a tendency to decrease the young population and the young adult population, since the average number of children per woman is decreasing because currently

the presence and easy access to contraceptive methods provides the possibility of choosing to have children and for economic, social or convictions situations some population refrains from having them. While mortality rates are expected to increase as the population continues to age, that is, if between 2015 and 2020 there has been an average of 739,000 births each year, this figure would be only 526,000 between 2050 and 2055, and would fall even further between 2095 and 2100, as there would be fewer than 381,000 births per year. In contrast, while today's average annual deaths are around 272,000 each year, by mid-century they would more than double 538,000 in 2050 and 670,000 in 2100.

In the last two decades of the 20th century, the Colombian population grew at an average rate of 1.5 %, a value that has been decreasing to 1.1 % at present. It is expected that in the long term it will converge to zero and that in 2050 it will be 0.1%. This stabilization of the national population is in line with the Latin American average, whose growth rate for 2014 was 1.3% and for 2050 is expected to be 0.3% (Cotlear, 2011).

Therefore, Sogamoso and its surrounding municipalities are not exempt from these phenomena since observing the projections until 2035 the population in Sogamoso will grow to 147,377 inhabitants also increasing the degree of urbanization since it is currently estimated that 80% of the Latin American population lives in urban areas (Celade, 2014), while in Colombia that percentage is 77%. The average number of people that in 2050 will live in urban areas is estimated to be 86 %, slightly lower than the Latin American average estimated by Celade (90 % for the same year). According to these projections, it is necessary to analyze these figures for the development of the smart territory in the city of Sogamoso as they allow foreseeing future situations, to establishing an action plan according to these results that will allow facing the difficulties that may arise and thus adapt the city in all areas with the help of technology improving the quality of life of the inhabitants.

#### **4.5 Transportation Sector Characterization**

For the constitution of an intelligent territory, one of the most important factors is mobility since moving within a territory efficiently, economically, and safely is a need that must be urgently covered, for which public transportation is one of the major participants in terms of improving the quality of service, in addition to attracting citizens to purchase this service benefits the environment by reducing the use of private vehicles and therefore the emission of gases into the atmosphere.

To improve mobility for citizens and visitors to the territory by facilitating travel within these 6 municipalities at night, allowing a decrease in the cost of fares and time when using a personalized transportation vehicle (TAXI), the possibility of eliminating the requirement of the Occasional Travel Form within the territory was identified, which is a document that must be carried as a driver of a public service vehicle (TAXIS) land motor vehicle so that they can provide transportation service outside the radius of action of their jurisdiction under Decree 1079 of 2015 ARTICLE 2. 2.1.3.4 in which an exemption is established to elaborate this form and make the payment when it is provided by vehicles of companies of the respective capital or Metropolitan Area and the municipality headquarters of the air terminal. In the ARTICLE 2.2.1.3.5.2 Decree 1079 of 2015.

Taking into account this regulation for metropolitan areas, it is proposed that in the municipality of Sogamoso by joining with the 5 municipalities previously mentioned as intelligent territory, this exception be taken advantage of and thus expand the possibility that cabs can provide services to



these municipalities, at different times without the user having to incur additional costs since on many occasions the value of the payroll is greater than the value of the race, benefiting the tourism sector of the municipalities as it allows the ease of transportation at any time within the territory.

Therefore, a classification of the existing public passenger transportation companies in Sogamoso is established to identify differences between them and shortcomings of the service to optimize transportation in the municipality.

#### **4.6 Economic Cluster**

Knowing the characteristics of tourism, culture, and transportation of the municipalities; and all the attributes that each one can offer to the economy of the department, it can be highlighted that Sogamoso has some additional and special characteristics which help it to be part of the tourist corridor of Boyacá, such as economic geology.

The area of the Sogamoso valley is well known for its mining ancestry being known that inside and outside the area of the municipality, geology has determined the existence of various economically exploitable deposits such as Coal phosphoric rock, recebo, sands, and clays, even when the deposits are not within the municipal perimeter, much of the population lives in the exploitation of limestone for the cement manufacturing process as raw material in the work of the company Cementos Paz Del Rio and Cementos Boyacá, for the production of lime and crushed for concrete, among others.

The economic synthesis shows that the mining activity is a fundamental part of the municipality's economy, since the large industries located in the area and the region of Boyacá and Casanareña depend on it, raw materials that are invested in the production processes of cement, iron, and fertilizers and construction materials. The population rudimentarily extracts clay to make bricks and handicrafts to a lesser extent (htt8).

On the other hand, the "industrial corridor of Boyacá" that corresponds to the "Economic Planning Region" is a territory that covers the municipalities of Ventaquemada, Samacá, Tunja, Combita, Ociará, Sotaquirá, Tuta, Paipa, Tibasosa, Duitama, Nobsa, and Sogamoso, characterized because they are all part of the Chicamocha river basin and because the greatest industrial development of the department has flourished in them.

Over time, companies have joined the industrial corridor of Boyacá creating progress and economic growth, being the companies that are part of this industrial corridor are:

- Paz del Rio steel mills, Nobsa siderurgica
- Argos, Sogamoso cement, Bavaria
- Bavaria, Tibasosa beverages
- Diaco, Tuta siderurgia
- Holcim, Nobsa cement
- Indumil, Sogamoso metalmechanics
- Industria de licores de Boyacá, Tunja liquors
- Invicar, Duitama transportation
- Postobón, Duitama beverages
- Termo Paipa, Paipa energetics

#### 4.7 Value added to GDP by municipality

For this reason, it was decided to analyze how much Sogamoso contributes to the Gross Domestic Product, but one of the most frequent problems when analyzing the structure of the GDP at the municipal level is the lack of real information on the subject, however, for the particular case of Sogamoso, it is possible to build some data from the Regional Economic Reports prepared by the DANE for the department of Boyacá and fundamentally, the documents of the local context.

One of the great unknowns in the economic dimension that would be worth solving is related to the impact of each of the economic sectors in the local economy and thus establish what is the real productive bet of the Municipality.

The following graph allows analyzing the added value generated by each of the economic sectors in the territory, in which primary activities such as:

- Agriculture, mining, and livestock correspond to 1.8%,
- Secondary activities such as industry generate an aggregate value of 38.8% and tertiary sector activities such as commerce
- Tertiary sector activities such as commerce generate the greatest impact on the local economy with 59.3%.

It is observed that within the large branches of economic activity in the municipality of Sogamoso, the sector that participates the most with 35.67% is the Manufacturing Industry, followed by Social, communal, and personal services activities with a participation of 20.10%, and Commerce, repair, restaurants, and hotels with 10.92%.

This represents an aggregate value of close to \$1,587,000,000,000 million pesos. At the regional level, the trends of the local economy define the following conclusions. In the first place, the consolidation of an economic model based on trade and the offer of services for an important part of the population that moves through the regional corridor formed by Tunja, Duitama, Sogamoso, and Yopal. This, as mentioned before, is strengthened by the strategic location of this region as a linked scenario between the central zone of the country and the Eastern Plains, besides being the epicenter of the Sugamuxi tourist circuit, offering diverse tourism options, the result of this is the growth of the participation within the economic structure of the trade and services sector. The added value that the territory contributes to the departmental GDP is 22.3%.



**Figure 5.** Value added by economic activities

Source: Own elaboration.

<b>Municipio</b>	<b>Valor Agregado 2016</b>	<b>Valor Agregado 2017</b>	<b>Peso Relativo %</b>
Aquitania	314	314	1.4
Iza	24	25	0.1
Nobsa	1598	1346	5.9
Sogamoso	2599	2675	11.6
Tibasosa	665	681	3.0
Tota	62	68	0.3

**Table 3.** Value added to GDP by municipality

Source: Prepared by the Duitama Chamber of Commerce.

The economic development of a region is proportional to the capacity to plan, do, verify and take actions when required. Boyacá is a department with an agro-industrial tradition that over the years has been diversifying its economic activities at the forefront of globalization processes, aiming at regional competitiveness. Proof of this is to be in eighth place out of twenty-six in the 2016 regional competitiveness index, with basic and intermediate education being the most representative aspect with a score of 7.62 on a scale of 1 to 10 (htt12).

Currently, the department of Boyacá has the Boyacá Dairy Derivatives Cluster initiatives but also works on the organization of the Metalworking Cluster with the Chamber of Commerce of Duitama and the Tourism Cluster for the Province of Sugamuxi with the Chamber of Commerce of Sogamoso since Boyacá strengthens the clusters of the department with others in the country (boyacaradio.com).

The productive organization has adequate infrastructure for its development, however, there are still some problems that must be solved to improve the production conditions and increase the positioning of the municipality as an integrating and articulating element of both the province of Sugamuxi and the central region of the country with the Eastern Plains. Given the above, the Governor's Office of Boyacá has promoted the creation of the Tunja-Sogamoso Economic Planning Region. This program seeks to increase competitiveness and integration between the cities of Alto Chicamocha, with special emphasis on strengthening sectors such as mining, metal mechanics, the automotive industry, and construction, whose offer is directed to the Bogotá market, the traditional center of trade and regional exchange of goods produced in the department of Boyacá.

Several intersectoral initiatives are identified within this industrial corridor: The agroindustrial cluster, especially for its potential for extra-regional production and sales in Colombia, targeting international market segments (potato, meat, dairy, fruit, vegetables, quinoa, sugarcane). One of the main economic sources is the production and marketing of large quantities of onions in the municipality of Aquitania.

#### **4.8 Mobility Application for Intelligent Territory**

The proposed mobile application to be developed was designed to improve the transportation sector of the municipality of Sogamoso and focused on the tourism sector of the territory since the purpose

of an intelligent territory is the implementation of technologies to improve the quality of life of citizens since currently in Sogamoso no application unifies the information of public transport and tourism.

The objective is to provide timely information to the user by collecting information in real time, allowing him/her to use the public transportation service according to his/her needs.

#### **4.8.1 Modules**

It is proposed that the application be divided into 3 modules:

##### **4.8.1.1 Transportation**

This module proposes to integrate:

- the information of the public transportation companies of Sogamoso, such as cabs, urban transportation buses, and inter-municipal transportation buses, in addition to linking the GPS for monitoring and location of the vehicles, which allows the user to know the actual location of the vehicle needed for their journey, in addition to the existing stops on the routes and the traffic light points of the municipality.
- Motion sensors on streets and roads, intelligent traffic light control, route monitoring by cameras, dynamic digital signage system on streets and roads, parking places, etc.
- fares, distances, and travel times according to the desired route so that the user has the opportunity to decide which service best suits his needs.
- Cycle routes and status of cycle routes.

##### **4.8.1.2 Tourism**

This module proposes to integrate and improve the application created for the province of Sugamuxi for the tourism sector, it is intended to be a much more interactive application and expand the database of tourist sites, including the means of transportation that can be taken to reach the destination, schedules, rates and contact possible tourist guides in the territory.

##### **4.8.1.3 Suggestion box**

This space will collect suggestions, compliments, or complaints from users of the application and service, to identify the shortcomings that are present in real time and timely for decision-making to provide better quality public transport.

#### **5. Conclusions**

The perception of users and service providers regarding the quality of public transportation is that it does not fully satisfy the mobility needs of citizens, since user service is sometimes not optimal, since it does not provide adequate, respectful, and responsible attention to the user, and due to traffic congestion there are traffic jams during rush hour in the central area of the municipality.

There is a deficiency in terms of adequate infrastructure of bicycle routes, which cover the need to protect cyclists as it is the most sustainable means of transport in the municipality and provides the opportunity to reduce costs to citizens and allows the decongestion of vehicles in the municipality, in addition, improving the roads potentiates the bicycle tourism as it reduces the risk of accidents and increases the flow of trade by the influx of tourists.

For the confirmation of the intelligent territory, it was determined that the municipality of Iza offers more opportunities to strengthen the tourism sector than the municipality of Pesca, at the time of forming a tourist ring within the territory, also in the studies previously carried out in the requests to the governors, the mayor of Pesca expressed no interest in participating in the conformation of a metropolitan area.

Sogamoso, as one of the largest municipalities in the department and with the largest population volume, is one of the 61 municipalities evaluated in the maturity model proposed by Mintic, which provides guidelines for the creation of intelligent territories; a model that was applied for the elaboration of strategies based on the established dimensions.

In the territory, no infrastructure provides the facility for disabled people to access public transportation services, so the transit becomes an unsafe and uncomfortable act, so it is evident the need to take into account significantly this population when making action plans in the transportation sector.

To constitute the municipality of Sogamoso and some municipalities of the Sugamuxi province as an intelligent territory is viable because it provides opportunities to improve the quality of life of the community, based on the strategies applied to each dimension of the maturity model.

## **6. Recommendations**

It is recommended that the proposed maturity model applied in the competitive advantages and strategies for the territory be taken into account when implementing the constitution of the smart territory.

It is recommended that, at the time of creating the smart territory, the application should be created with the information provided in the proposal, so that the users receive the benefits that allow the improvement in the quality of life.

It is recommended that the action and investment plans for infrastructure in the territory analyze and implement improvements that benefit the disabled population since it is a vulnerable population and is not treated equitably in the provision of public transportation and mobility services within the municipality.

It is recommended that the infrastructure for bicycle routes should be adapted and expanded to benefit both the educational and labor sectors.

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## **Digital Transformation In The Education Sector Due To The Impact Of Covid-19**

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### **Abstract**

A documentary review was conducted on the production and publication of research papers on studying the variable Digital Transformation, Education and Covid-19. The bibliometric analysis proposed in this document aims to know the main characteristics of the volume of publications registered in the Scopus database from 2020 to 2022, achieving the identification of 464 publications in total. The information provided by this platform was organized using tables and figures, categorizing the information by Year of Publication, Country of Origin, Area of Knowledge and Type of Publication. Once these characteristics were described, the position of different authors regarding the proposed topic was referenced through qualitative analysis. Among the main findings of this research, it is found that Spain, with 49 publications, was the country with the highest global production. The area of knowledge that made the most significant contribution to the construction of bibliographic material related to the study of Digital Transformation, Education and Covid-19 was the area of Social Sciences with 253 published documents, and the type of publication that was most used during the period mentioned above was the journal article, representing 54% of the total scientific production.

**Keywords:** Digital Transformation, Education, COVID-19

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### **1. Introduction**

The emergence of the COVID-19 pandemic in today's world has left significant scourges of great impact on the world and affected the different aspects of life, such as health, economy and, of course, education (Orbea et al., 2021). However, unlike other health emergencies recorded throughout history, the Coronavirus or COVID-19 had a determining factor of technological development and access to information of great importance since the use of technological tools and the Internet allowed mitigating many of the problems that arose from the isolation determinations in favor of the contagion of the disease.

Education was an issue to be considered by the great leaders of the different governmental entities since confinement represented a real challenge for the different traditional teaching models that had been taught with great effectiveness for decades. Although technology has already played a fundamental role in education, in many regions of the world, access to it is still scarce due to different socio-economic and cultural factors. The truth is that the application of these technologies as teaching methods is innumerable and allows a more assertive adaptation to the imminent because of the Covid-19 (Viewnext, 2020).

However, the real challenge did not consist in establishing objectives for the implementation of these tools for the delivery of the different education programs at different levels, nor in the work of the teacher in transcending to more modernized means to apply their methods, but in the immediacy demanded by the reality of the pandemic in its state of a health emergency (Rodríguez et al., 2021). Therefore, this problem had to be solved under a generalized uncertainty and in the framework of an unprecedented reality that would give a starting line for beginning policies within educational institutions worldwide to mitigate the risks and cover the failures derived from this nature.

The joint help of all social actors was required under all budgets to face the problems, challenges and links presented along the way in the search for excellence and quality education.

Indeed, it is essential to review how the various educational sectors have taken on the challenge of providing their services, to analyze the efforts to address their own needs, the results of social inequality, the lack of resources in various sectors of the communities, etc. For this reason, it is important to know through bibliographic resources the measures adopted to assume the digital transformation in the education sector due to the impact of COVID-19, so a bibliometric analysis of the scientific production registered in the Scopus database during the period 2020-2022 is proposed to answer the question: How has been the production and publication of research papers related to the study of the variables Digital Transformation, education and COVID-19 during the period 2020-2022?

## **2. General Objective**

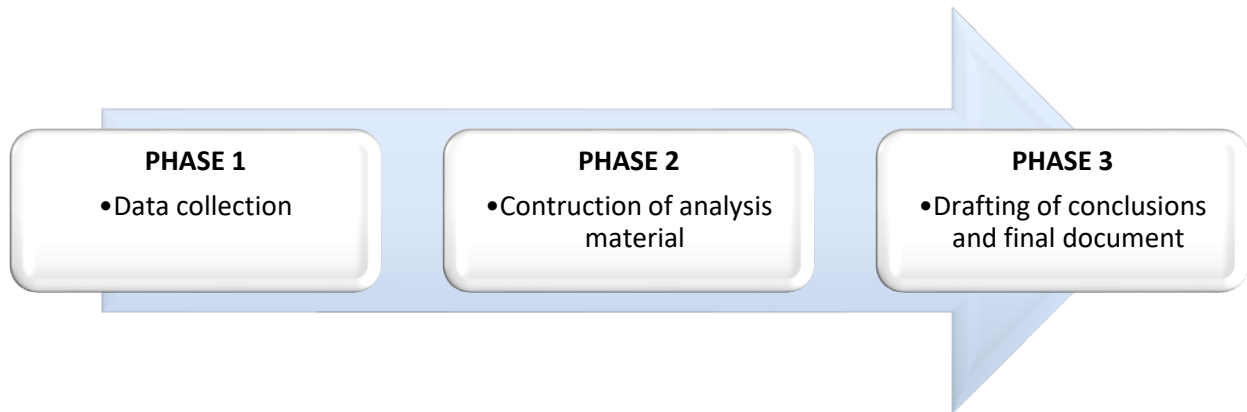
To analyze from a bibliometric and bibliographic perspective, the production of research papers on the variable Digital Transformation in the Educational Sector during the Covid-19 pandemic indexed in the Scopus database.

## **Methodology**

Quantitative analysis of the information provided by Scopus is performed under a bibliometric approach on the scientific production related to the study of Digital Transformation in the educational sector due to the impact of Covid-19. Likewise, it is analyzed from a qualitative perspective, examples of some research papers published in the area of the study mentioned above, from a bibliographic approach to describe the position of different authors on the proposed topic.

The search is performed through the tool provided by Scopus and the parameters referenced in Figure 1 are established.

### **3.1 Methodological design**



**Figure 1.** Methodological design

**Source:** Own elaboration

### 3.1.1 Phase 1: Data Collection

The data collection was carried out using the Scopus web page search tool, through which a total of 464 publications were identified. For this purpose, search filters were established consisting of:

- ✓ Published documents whose study variables are related to the study of the Digital Transformation variable in the education sector due to the impact of Covid-19.
- ✓ Without distinction of country of origin.
- ✓ Without distinction of area of knowledge.
- ✓ Without distinction of type of publication.

### 3.1.2 Phase 2: Construction of analysis material

The information identified in the previous phase is organized. The classification will be made through graphs, figures and tables based on data provided by Scopus.

- ✓ Word Co-occurrence.
- ✓ Year of publication
- ✓ Country of origin of the publication.
- ✓ Knowledge area.
- ✓ Type of Publication

### 3.1.3 Phase 3: Drafting conclusions and final document

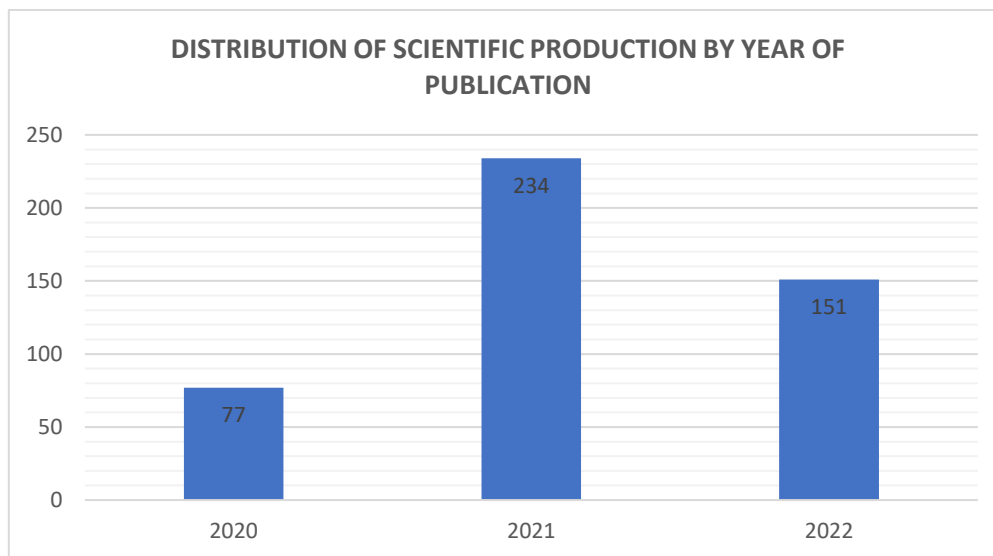
After the analysis in the previous phase, the next step was to draft the conclusions and prepare the final document.

## 4. Results

### 4.1 Co-occurrence of words

Figure 2 shows the co-occurrence of keywords within the publications identified in the Scopus database.





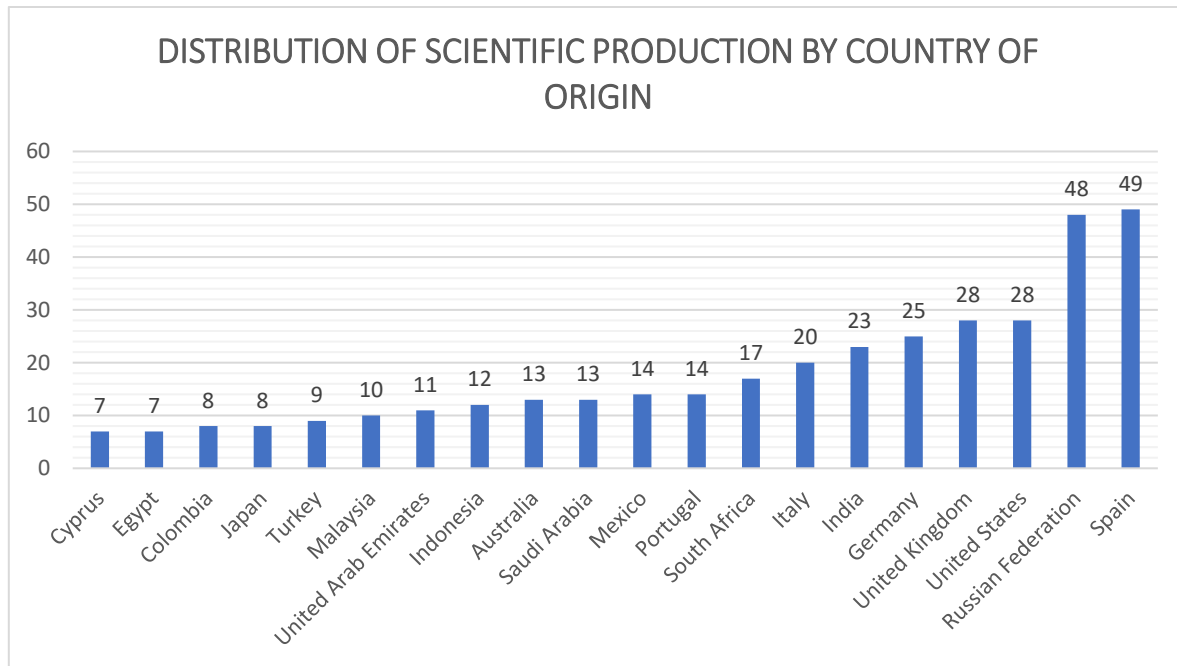
**Figure 3.** Distribution of scientific production by year of publication.

**Source:** Own elaboration (2022); based on data provided by Scopus.

The temporal delimitation of the present study adheres to the reports in Scopus of research papers framed about Covid-19. That is, the existing samples have been taken since the disease was the subject of research and publication of scientific findings in journals indexed in the same platform until those published at the date of writing this document (September 2022) in order to obtain a more general view of the positions of researchers during and after the health emergency. It can be seen in the Figure above how in the year 2020, the total production was 77 documents related to the impact of Covid-19 on education and how this caused the virtualization of academic contents to give continuity to school and professional training. By 2021, this Figure reached 234 published papers, understanding that by that time, the data could be complete and the measurement of impact could be more holistic. Finally, in 2022, 151 publications have been registered, with the last quarter of the year still to come, so the number of publications is expected to be higher than in the previous year. Among the most recent and high-impact publications is the article entitled “COVID-19 and the key lessons of digital transformation for higher education institutions in South Africa”, whose objective was to investigate and identify ten key lessons of digital transformation for higher education institutions in South Africa (Mhlanga et al., 2022), whose objective was to investigate and identify ten critical digital transformation lessons from COVID-19 for South African higher education institutions. The researchers took into account the issues generated by the mandatory closure of educational institutions and the need to resort to the use of technological tools to follow the academic calendar set by educational management. One of the data of most significant impact identified by the authors narrate how a country like South Africa still has inequality gaps in terms of access to digital devices and internet connectivity, so the virtualization of academic content represents a complex problem within a large number of families who do not have access to such tools; therefore, the study urges governmental actors to invest in the generation of digital competencies in parents and students, and of course in guaranteeing access to technological resources to comply with a fundamental right such as education, in times of crisis such as the one experienced due to Covid-19.

### 4.3 Distribution of scientific production by country of origin.

Figure 4 shows how scientific production is distributed according to the nationality of the institutions with which the authors are affiliated.



**Figure 4.** Distribution of scientific production by country of origin.

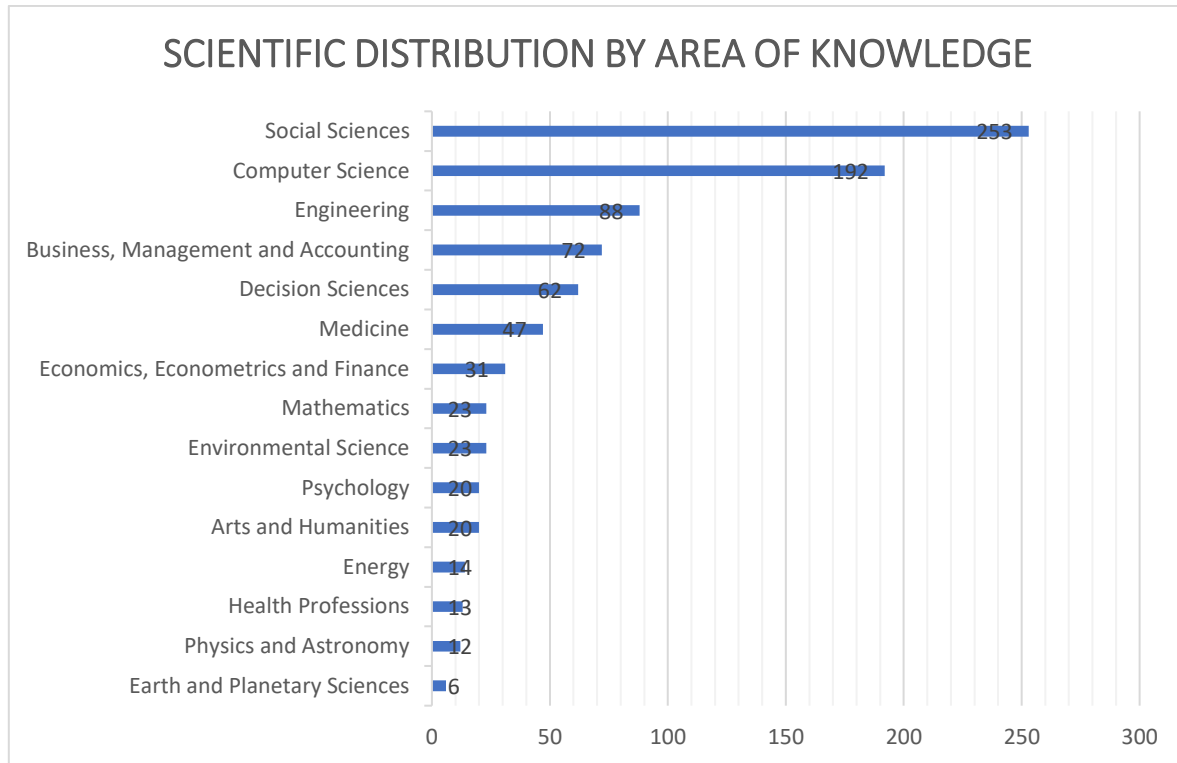
**Source:** Own elaboration (2022); based on data provided by Scopus.

Spain was the country with the highest number of publications carried out in journals indexed in Scopus related to the study of Digital Transformation in the education sector because of Covid-19 with a total of 49 publications, followed by Russia with 48 documents and the United States and the United Kingdom each with 28 publications. On the other hand, Mexico was the Latin American country with the highest number of publications registered in Scopus with a total of 14 documents, among which was the article entitled “Implementation of active learning as a digital education strategy during COVID-19” (Suarez-Escalona et al., 2022), whose purpose was to show the methodology used in a public university in northeastern Mexico for the transformation of the face-to-face modality to the digital modality based on the health contingency of COVID 19. This methodology was called Design Thinking, which consists of six steps: the presentation of the contents of the subject, the asynchronous seminar-type session for the discussion of the topics presented, the development of the integrative learning product PIA divided into advances with their respective comments. The suggested tools were the Microsoft Teams, Forms and Turnitin platforms, and the didactic strategies proposed were the inverted classroom, active learning and inquiry-based learning. The above was an excellent adaptation to the methodological changes presented by the virtualization of academic content caused by the measures imposed to reduce the number of infections and deaths due to Covid-19.

At this point, it should be noted that the production of scientific publications, when classified by country of origin, presents a particular characteristic: collaboration between authors with different







**Figure 6.** Distribution of scientific production by area of knowledge.

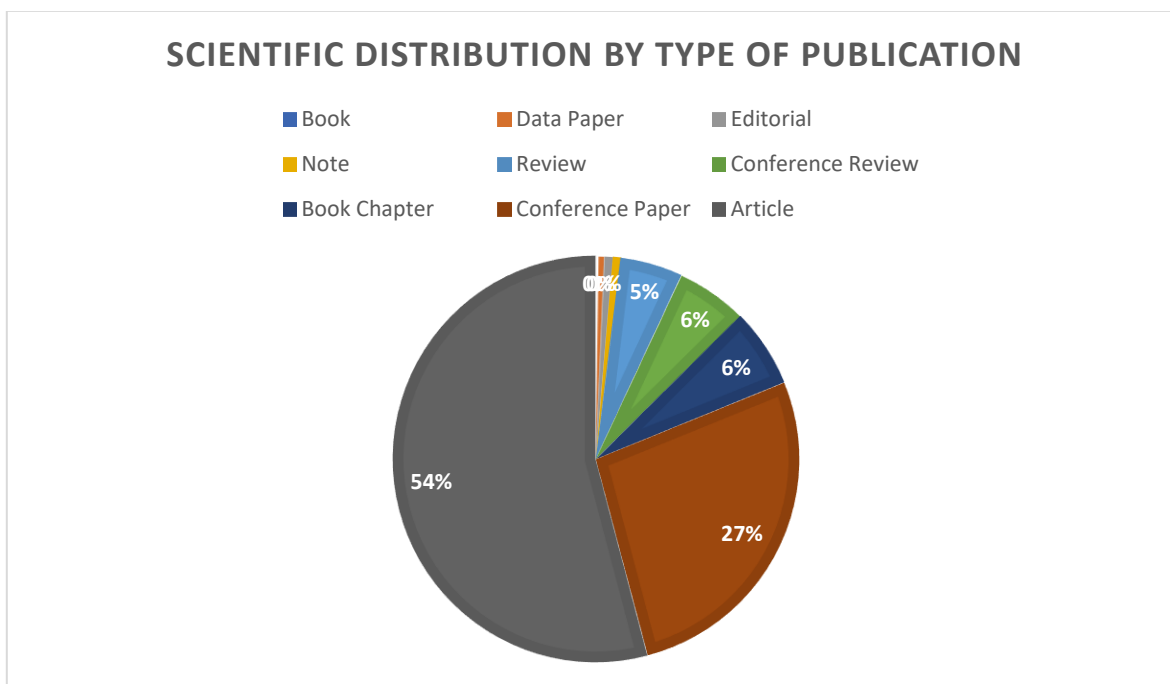
**Source:** Own elaboration (2022); based on data provided by Scopus.

Due to the nature defined in the interaction of the variables that seek the explanation and analysis of the response by a sector such as education to the impact generated by a health crisis of the magnitude of Covid-19, it is possible to consider that the area of knowledge that has had the most significant influence in the execution of research projects is the Social Sciences since the scope identified can be measured under the social impact that the digital transformation has generated within the educational methodologies due to the aforementioned disease. This area of knowledge allowed the publication of a total of 253 scientific publications indexed in Scopus between 2020 and the year 2022, followed by Computer Sciences that supports the study of the technological component within the digital strategies to migrate the face-to-face methodology to the virtual one and everything that involves the adaptation and virtualization of academic content in order to give continuity to the academic objectives despite the social isolation measures imposed to mitigate the impact on the transmission of the Covid-19 virus. Furthermore, within the total of 192 publications carried out based on theories inherent to Computer Science, the article entitled “Digital Transformation - New approaches and challenges in education” was identified, whose purpose was to explain the process of adaptation and virtualization of academic contents in order to give continuity to academic objectives despite the social isolation measures imposed to mitigate the impact of the Covid-19 virus transmission (Softic et al., 2022), whose purpose was to explain the process of adaptation of both teachers and students to the virtualization of academic content arising from the declaration of the pandemic because of Covid-19 and show how the digital transformation is one of the main objectives to be pursued by the academic management, not only to face moments of crisis as mentioned above but to increase the

levels of competitiveness and educational quality to meet the needs of all stakeholders related to education.

#### 4.5 Type of publication

Figure 7 shows how the bibliographic production is distributed according to the author's chosen publication type.



**Figure 7.** Type of publication

**Source:** Own elaboration (2022); based on data provided by Scopus.

Among the different alternatives available to researchers to disseminate their findings on education and digital transformation within the framework of Covid-19, the Journal Article with 54% was the most frequently used, followed by Conference Articles with 27%, Reviews and Book Chapters with 6% and Books with 5%. However, it is essential to consider that the conferences at the world level almost, if not all, had to be developed through synchronous or asynchronous virtual meetings since their face-to-face programming was postponed and, in some cases, canceled indefinitely in response to state ordinances that sought to promote social distancing, self-care, avoid crowds, consequences that of course, the educational sector forced the virtualization of all training strategies for as long as the health authorities considered.

#### 5. Conclusions

Thanks to the bibliometric analysis carried out in this article, it is possible to determine that within the main characteristics in the volume of scientific production related to the study of Digital Transformation in the Education Sector by the Covid-19 Impact, the year in which the most significant number of documents published in high impact journals indexed in Scopus was 2020 with a total of 234 publications. Spain had the highest number of records published worldwide, with 49

documents managed between 2020 and 2022 (up to the date of writing this document), followed by Russia with 48. It is essential to consider that government efforts to reduce the number of infections and deaths due to Covid-19 forced multiple economic sectors, including education, to dispense with any face-to-face activities that were being carried out, which forced educational institutions to migrate their strategies to virtuality supported by the use of digital devices and Internet connectivity. The main strategies were based on the assignment of academic activities under different modalities, virtual synchronous, which is based on the simulation of the dynamics presented in a classroom, but through technical programs, and virtual asynchronous, which involved the fulfillment of academic activities without the need for virtual meetings in real-time, under the setting of schedules and deadlines. The use of technological tools to give continuity to the teaching-learning processes represented a challenge for the educational management since it required not only that students were ready to receive their classes virtually but also to keep the teaching staff updated in terms of the digital skills necessary to continue the quality educational training as it is perceived face-to-face. Aspects such as motivation and continuous training became, for the administration, one of the most critical objectives in everything related to the virtualization of content since teachers needed to have all the necessary skills to transmit confidence to their students and thus maintain the quality of training. Despite all the efforts mentioned above, many authors cited in this article agree with the identification of one of the most latent and evident problems in most countries, and that is inequality and the digital divide, a term coined to explain that hundreds of thousands of families do not have the same possibilities as others, to quickly access technological devices or connectivity to an Internet network that allows students to access virtual education as the only alternative to carry out their academic goals. Therefore, it has been suggested by the scientific community to increase governmental efforts to guarantee access to virtual education by providing these families with technological resources and the Internet, and in this way, achieve the fulfillment of one of the Fundamental Rights, such as education. Finally, this article concludes by highlighting the importance of knowing the current status of publications concerning the study of the impact of Covid-19 on educational management and digital transformation since, through this information, it is possible to generate new knowledge that supports this sector in the search for new and better alternatives to ensure access to education under any circumstances and even in support of a new global trend that speaks of the emergence of Hybrid Education that combines face-to-face strategies with virtual strategies in order to increase coverage in education.

### **Acknowledgment**

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## JOURNAL OF LANGUAGE AND LINGUISTIC STUDIES

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### Feedback Techniques in English Writing Course: Exploring Adult English Language Learners' Perceptions and Experiences

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#### Abstract

**Background:** Research and attention around English writing in the second/foreign language context is increasing. Learning to write in English is essential to developing other language skills including speaking, listening, and reading. One of the most important aspect of learning how to write in English is feedback. **Purpose:** The present study explored the feedback techniques used by English teachers during ESL/EFL English writing classes in an intensive English program. Specifically, the study aimed to examine English language learners' perceptions regarding what feedback strategies they believe are useful and why. **Method:** Qualitative data were collected through semi-structured interviews with adult language learners who study English as a second language. **Results:** The study confirmed that several types and sources of feedback – such teachers' and peer feedback – were used and preferred by the language learners. However, the participants seemed to accept or refuse the provided feedback depending on whom they received the correction from. They showed signs of confidence when accepting their teachers' feedback, while showed hesitation in accepting their peer feedback. **Implications:** The study suggests that more emphasis should be placed on learners' own abilities to provide corrective feedback. There is a need to increase learners' confidence to accept feedback provided by their peers.

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**Keywords:** Corrective Feedback; English writing; writing errors; Peer feedback; ESL; EFL

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#### 1. Introduction

Over the past decade, the theoretical perspectives on teaching English writing in second-language (ESL) contexts have become more prominent in the field of second-language acquisition. Researchers have continued their efforts to understand how language acquisition occurs and how reading and writing are learned and acquired. The practice of teaching writing has been influenced by many learning and literacy theories that perceive writing as an essential skill in language learning development. Some of these were developed to understand and explain how writing is learned and taught. As an example, Sociocultural Theory provides an explanation of the importance of social context in learning how to read and write. Bazerman (2016) states that Sociocultural theorists perceive writing as a social act in which individuals write to “participate in social situations” (p.11). This social view of writing allows for an understanding

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of how individuals can use writing to communicate, construct, and gain voice and identities within a community or a society. Cognitive Learning Theory, developed by Jean Piaget, emphasizes the role of the brain and memory in literacy development. This theory perceives literacy as a mental process in which the child is impacted by both internal and external factors that lead to learning development. MacArthur and Graham (2016) point out that cognitive theories have made and still make important contributions to the understanding of writing learning and teaching. They add that cognitive perspectives perceive writing as a complex goal-directed problem-solving process that is associated with writers' knowledge, techniques, language, skills, and motivational resources.

However, the most recent theories associated with literacy learning are New Literacies & Multimodal Theories. These theories have resulted from the rapid economic, cultural, and social changes in today's world. Grabill and Hicks (2005) summarized teaching how writing should be taught during today's technological revolution:

If we want to teach writing or help students learn how to write more effectively, then we have to see writing in the same ways that they do and be with them where they write. Networks are classrooms. Digital writing is socially situated in a collaborative, recursive and responsive space in which teachers must participate with their students (p. 306).

In the second/foreign language context, the body of research concerning the teaching and learning of English writing is substantial. That is because writing is one of the most fundamental skills in second-language development. Haynes and Zacarian (2010) point out that learning how to write in English is vital to the development of other language skills such as speaking, listening, and reading. They add that learning to write in English is a "developmental process" that includes the ability to meaningfully communicate using writing, to write for different purposes, to use appropriate language, and to use correct grammar and forms. Cook (2016) noted that learning to write is a complex process that involves both low- and high-level processing skills. In other words, when learning to write in English, language learners go from learning how to form letters to higher-level skills such as spelling and writing essays. Cook added that learning writing also involves being able to receive and learn from feedback provided by writing teachers.

### *1.1. Purpose and Significance*

Lee (2014) indicated that feedback is a significant aspect of the learning and teaching of English writing. It plays a pivotal role in improving learners' writing skills (Cunningham, 2019; Lv et al., 2021; Mekala & Ponmani, 2017). In fact, feedback has remained one of the most researched topics related to teaching and learning English (Lee, 2014). However, though much research has focused on the strategies used to teach and learn English writing, research concerning language learners' perceptions about the types of feedback used in ESL/EFL writing courses is limited. There is a dearth of literature that examines feedback from the language learner's perspective. Thus, the current study aims to find out what types of feedback strategies are used in English courses and what types of feedback strategies English Language Learners (ELLs) find useful and helpful to their writing skills and why. As such, the current study seeks to explore qualitatively adult language learners' perceptions regarding the most effective and beneficial feedback strategies that can be used to develop their writing abilities.

Exploring ELLs' perceptions is important because it will provide second/foreign language educators with valuable information about the most effective and desired feedback strategies that can be used to develop the writing skills of ELLs. Moreover, such knowledge will extend the understanding of what types of feedback strategies ELLs find more useful and why. This knowledge helps ELLs have a voice and allows English teachers to be aware of learners' preferences in terms of how to develop their writing skills.

### *1.2. Research questions*

In an attempt to explore language learners' perceptions, the following research questions guided the study:

- What types of feedback strategies are used in English writing classes?
- What types of feedback strategies do language learners find useful in developing their English writing skills?

## 2. Literature Review

Research on second-language writing has increased as researchers have studied and explored different approaches to teaching English writing. Second-language researchers have recognized feedback as a significant aspect of English writing, learning, and teaching (Amara, 2015; Bitchener, 2008; Fareed et al., 2016; Karim & Nassaji, 2020; Klimova, 2015; Mishima, 2018; Tian & Zhou, 2020; Selvaraj & Aziz 2019). Lee (2014) states that one of the most vital aspects of English writing, teaching, and learning is feedback. It plays a fundamental role in enhancing and improving the writing skills of English language learners. Feedback and error correction has remained one of the most researched topics related to teaching and learning English (Lee, 2014). Van Beuningen (2010) reports that research in the field of second language learning has focused on whether corrective feedback develops students' writing skills and helps them become more competent writers. Over the years, researchers have examined the effects of different types of corrective feedback used to develop ELLs' writing skills.

A study by Ismail, Maulan, and Hassan (2008) discusses the effect of teachers' feedback on English learners' writing. This study was conducted to better understand whether teacher feedback had a direct impact on developing students' writing abilities. The study sample involved 187 English diploma students. The study was an experimental study in which students were given three different essay topics to write about. The participating students then were asked to rewrite these essays based on their teachers' feedback. The students' original and revised essays were scored based on content, organization, and language. The study findings revealed that even a minimal amount of feedback from the teacher helped students improve their writing abilities. There was a significant difference between the students' original and revised work. The study suggested that feedback provides students with more self-correction opportunities, which in turn prepare them for more improved writing in the future.

Maarof et al. (2011) also investigated the role of different feedback strategies in developing the writing skills of English-language learners. Specifically, the study aimed to examine students' perceptions of the use of teacher feedback and peer feedback during ESL writing classes. The participants included 150 English language learners from five different secondary schools in Malaysia. The participating students responded to a questionnaire that was designed to elicit students' opinions regarding how teacher and peer feedback enhanced their English writing skills. The researchers found that the students valued the combined use of both teacher and peer feedback. In other words, the participating students believed that both teacher and peer feedback played a major role in developing their ESL writing skills. Maarof et al. (2011) concluded by stating that feedback, whether it is from teachers or peers, is an important aspect of any ESL writing class. That is because feedback plays a complementary role in enhancing ELLs' acquisition of English writing skills.

Additional research on different feedback strategies used to develop English writing skills was presented in a 2010 study by Zhao (2010). In this study, the researcher compared the use of peer and teacher feedback strategies among English-language learners. Specifically, the study was undertaken to examine Chinese ELLs' understanding of and use of peer and teacher feedback as ways to develop their English writing skills. Eighteen Chinese university-level language learners participated in the study for sixteen weeks. The research method included content analyses of students' use of feedback and interviews about their understanding and responses to feedback provided by English teachers. The study findings suggested that it is difficult to compare the value of teacher and peer feedback strategies used to enhance the writing skills of ELLs. The participating language learners preferred teacher feedback more than peer feedback because they viewed it as more important and trustworthy. However, the researcher reported that because they used their first language when interacting, the learners tended to understand peer feedback more. Zhao (2010) concluded by stating that language learners need to understand the values of both strategies and be exposed to different types of feedback techniques to develop their writing proficiency.

Like the Zhao (2010) study, Erlam, Ellis, and Batstone (2013) conducted a study in which two writing oral feedback approaches were compared. The researchers used "graduated" feedback with some learners, while other students were exposed to explicit feedback. Graduated feedback helps language learners correct their work with a minimal amount of assistance. Explicit feedback corrects students' errors directly and explicitly. The researchers were interested in examining and understanding students'

interactions with both approaches. The results of the study indicated that graduated feedback is an effective feedback strategy that promotes more self-correction and autonomy. Explicit feedback, in contrast, promotes less self-correction but can be accomplished more quickly and easily. Erlam et al., (2013) concluded by stating that even though both the graduated and explicit approaches are effective in developing learners’ writing skills, explicit feedback requires less effort and time than graduated feedback, and for this reason “it can be considered more efficient” (p. 12).

Ultimately, developing ELLs’ writing abilities is one of the most important goals of all language teaching and learning. For language researchers (Lee, 2014; Van Beuningen, 2010; Rahimi, 2021; Zhao, 2010), learning to write facilitates learning and mastering other language domains including reading, speaking, and listening. The literature shows that when learning to write, feedback is an important factor that leads to improved writing ability.

### 3. Method

This study used a qualitative research method to collect and analyse the data. The qualitative research inquiry allowed the researcher to explore ELLs’ perspectives and opinions regarding what types of feedback strategies they find useful. This method allowed for an in-depth examination of the participants’ opinions and preferences in terms of learning and teaching of English. Smith (2015) mentions that qualitative research methods allow researchers to gain in-depth understanding of the participants’ opinions and motivations.

Data were also collected through face-to-face interviews. Specifically, semi-structured interviews were conducted with language learners enrolled in advanced writing classes. Galletta (2013) states that semi-structured interviews allow researchers to deeply explore the participants’ opinions and provide them with the opportunity and space to add new meaning to the study. Also, the semi-structured interview “offers great potential to attend to the complexity” of the research topic (Galletta, 2013, p. 24).

One of the most significant advantages of the semi-structured interview is that it has ready-guided questions and at the same time it creates chances for the researcher to alter or include other questions to the interview to make the interview points clearer and more obvious. As well as, adding prompting questions or changing the interview questions also help investigators to elicit circumstantial information from interviewees. In the same vein, Bryman (2016) suggests that an investigator can conduct an interview implying a model which contains the main interview questions and possible prompting and interrogating questions which help the investigator to be consistent, to ensure that the interviewer does not miss or forget the discussion ideas. Moreover, this suggested model helps the investigator to ensure uniformity of treatment in all interviews

The participants included 20 adult language learners enrolled in intensive and volunteer English programs. The participants differed in their learning backgrounds and were learning English for different purposes including but not limited to developing their language proficiency, pursuing a university degree, and learning to communicate fluently in English. The participants were in an advanced English course in which writing is required for all students. The age of the participating learners ranged from 19- 40 years old. In terms of their educational background, four have a Master’s degree, while the others will pursue Bachelor’s degrees. Purposive sampling was employed in this research to ensure that all participating learners are currently studying English as a second language. Table 1 provides more information about the participants. Note: Pseudonyms were used for the participant’s names.

**Table 1.** The participants.

<i>Participants</i>	<i>Age</i>	<i>Proficiency Level</i>	<i>Education</i>
Nora	32	Advanced	Master
Sai	2	High-intermediate	Bachelor
Jin	3	Low- intermediate	Bachelor
Chen	33	Advanced	Master
Alaa	19	High-intermediate	Bachelor
Sali	22	High-intermediate	Bachelor
Den	24	Low- intermediate	Bachelor
Quin	26	Low- intermediate	Master
Alan	19	Advanced	Bachelor
Sehi	20	High-intermediate	Bachelor

Mandi	21	Advanced	Bachelor
Sami	40	Low- intermediate	Bachelor
Ahmed	19	Advanced	Bachelor
Jin	20	High-intermediate	Master
Salenm	30	Advanced	Bachelor
Mera	24	High-intermediate	Bachelor
Qun	32	High-intermediate	Bachelor
Eli	29	Low- intermediate	Bachelor
Asma	28	Advanced	Bachelor
Abad	20	Low- intermediate	Bachelor

Finally, for the data analysis, thematic analysis was used to answer the research questions. Figure 1 illustrates the data collection and analysis procedures used in the study.

**Figure 1.** Data collection and analysis procedures



The data analysis comprised two stages. First, the interviews with the participants were transcribed verbatim. The researchers read through the responses to gain insight into which feedback strategies language learners found useful and why. Second, codes were assigned to the participants' responses. The first and second cycles of coding led to the creation of categories and more general themes that reflect the research questions. In the first cycle coding, In-Vivo and descriptive coding strategies were used. These techniques help identify codes using the participants' own words (Saldaña, 2016). In the second cycle coding, pattern coding strategies were used. Pattern coding helps narrow down the data into more focused and direct categories. Figure 2 provides more information about the data analysis process with samples of codes, categories, and the emerged themes

**Figure 2.** The data analysis process

Sample of Codes	Categories	Themes	Definition
Direct error correction Grammatical errors Guidelines Self-correction Indirect feedback	Explicit Feedback Implicit Feedback	<b>Feedback Provision</b>	This theme reflects the way corrective feedbacks were provided to students during writing classes and how language learners received them.
Classmates feedback More correction Lack of experience Teachers' knowledge Peer knowledge	Teachers' Feedback Peer Feedback	<b>Feedback Sources</b>	The theme represents learners' perceptions about the sources in which the students receive corrective feedback and whether it is from teachers or their peers.
Lack of confidence No experience Type of feedback Lack of skills	Accepted Feedback Rejected Feedback	<b>Feedback Acceptance</b>	This theme reflects the participants' decisions of either accepting or refusing the provided error correction.

## 4. Results

In terms of revealing what types of feedback ELLs think is useful for improving their writing skills, the thematic analysis of the data revealed three main themes and subthemes: feedback provision, different sources of corrective feedback, and feedback acceptance. These themes and subthemes reflect the research questions and identified the most useful and effective feedback strategies that can be used in English writing courses. The following section will unpack each of these themes in detail. The names of the participating students are pseudonyms.

### 4.1. Theme 1: Feedback Provision

The first theme that emerged from the data was feedback provision. This refers to the way corrective feedback, whether explicit or implicit, was provided to students during writing classes. Students reported that they received different types of corrective feedback. Some participants preferred to receive feedback about their writing explicitly, while others preferred implicit error correction. The students described the benefits of both feedback strategies.

#### *Explicit Feedback*

The students' responses revealed that explicit feedback is a beneficial corrective feedback strategy that helped them develop their writing. According to the students, explicit feedback provides clear and helpful teaching moments, allows them to know their strengths and weaknesses in terms of writing, and develops their writing abilities. This was exemplified in these three responses:

We receive many types of feedback from our teachers in writing classes. I prefer when he/she directly shows me my errors. For me, this is a learning moment because I know where my errors are. I usually learn from correcting these errors. [Salem]

My writing got really better when I read my teachers' feedback. Also, when I see my errors, I know my strengths and weaknesses. I mean, when writing teacher mentions that there is a grammatical mistake here or wrong verb tenses there, I immediately know that I have to work on developing my writing in this certain topic. [Jin]

One of the ways that develops my writing abilities is correcting my errors directly. I think this way helps me develop my writing accordingly. When I know my mistakes, I can learn from them. Not knowing my mistakes is confusing for me and requires me to waste a lot of time trying to figure them out [Mera]

In general, the data showed that some participants preferred the explicit or direct corrective feedback strategy. They believed this type of feedback offers a learning moment that helped them identify their strengths and weaknesses and develop their writing skills.

#### *Implicit Feedback*

Another subtheme identified in the students' responses is implicit feedback. Some participants believed that implicit or indirect feedback helped them develop their writing skills. This strategy increases their learning autonomy, allows them to be more engaged in the learning process, and increases their motivation. As mentioned by these three students:

For me, I really like indirect feedback for my errors. It helps me be responsible for my own learning. To correct the error, I have to read and try to figure out my mistake. In other words, Indirect feedback helps me control my own learning. [Sami]

Our writing teacher uses direct and indirect feedback methods to correct our mistakes. I personally prefer indirect feedback because it allows me to be engaged in my learning. It is more interactive way of learning because I have to think about the errors before correcting it. [Mandi]

I like when my teacher let us think about the errors before correcting them. He did not correct them immediately. We have to think and figure out what is wrong with the sentence. This really motivate us to write and learn from our mistakes. [Den]

From the students' responses, it was clear that some of them preferred implicit or indirect feedback over explicit feedback. Implicit feedback developed their self-learning, improved their engagement in their learning, and increased their motivation.

#### 4.2. Theme 2: Feedback Sources

The second theme that reflects the participants' responses is feedback sources. This refers to the sources from which the students receive corrective feedback (teachers or their peers). In other words, the participating students reported that they prefer teacher or peer feedback depending on their writing needs.

##### **Teacher Feedback**

Feedback from teachers was mentioned consistently by the participants as their most preferred source of corrective feedback. The students have more confidence in the feedback when teachers correct their writing. They believe that feedback from teachers typically focuses on three language elements: grammar, word choice, and writing coherence. This was illustrated in these responses:

There are many types of feedback we received in every written assignment. Most of the time, our teacher focuses on correcting our grammatical errors such as verb tenses, subject-verb agreement, articles, and prepositions. These corrections helped us develop our grammar by learning these rules. I think the purposes of correcting our writing is to develop my grammar and word choices. [Alan]

Beside grammar errors, I always have some issues in writing incorrect words or words that do not fit in the sentences. That is why I prefer teachers' feedback because they usually suggest better words for better writing. For instance, I learn many academic vocabulary words by reading teachers' corrections. [Den]

Writing is really difficult for us. We try to write like native speakers. However, sometimes our writing is not clear. Writing teachers helped us make our writing clear and readable. [Sali]

##### **Peer Feedback**

Another source of corrective feedback mentioned consistently by the participants was peer feedback. This refers to students working in groups or pairs to correct each other's writing. Even though this type of correction does not inspire much confidence among students, they indicated that there are benefits to this method. For example, they develop a sense of collaboration in their writing classes, improve their autonomous learning skills, and become more independent language learners.

One of the activities that we do in writing classes is correcting each other's writing. In all honesty, I find it really useful. However, I cannot expect it all the time because we do not have the language skills that our teacher has. I believe these activities make us work in groups, and that is really beneficial. Working in group makes the writing classes more interesting and enjoyable. [Aala]

Sometimes, we were asked to correct each other's writing in class. The teachers arrange us in pairs and we have to read and edit our papers. I like these types of activities because they make us responsible for our own learning. We have to depend on each other and not our teacher to develop our writing. [Chen]

The participants consistently identified peer feedback as an important source of corrective feedback in terms of their writing. The responses indicated that peer feedback improves the classroom interaction and allows for more collaborative and autonomous English learning.

#### 4.3. Theme 3: Feedback Acceptance

Finally, feedback acceptance is another theme that was consistently mentioned by the participants. This theme reflects the participants' decision to either accept or refuse the provided corrections. Most of the time, acceptance was associated with the source of the feedback. In other words, students tended to accept, without hesitation, their writing teachers' corrections because of their confidence in the

proficiency of the teacher. On the other hand, the participants showed some signs of hesitation in accepting their own or their peers error corrections. The following quotes illustrate this theme:

I usually have many conversations with my classmates when they correct my writing. In many cases, we go to the teacher because I believed that their corrections were not accurate. Also, they usually do the same thing with me. We are still learning the language, so mistakes happen. However, when my teacher corrects my errors, I know they are accurate and 100% correct. [Jin]

So, as I mentioned previously, we work together in fixing our writing. We do that many times during the writing classes. I, sometimes, don't like it when some of my classmate do the error correction. It not always true. In many times, we had these conversations about why they correct this or that. In some cases, I don't accept their judgment and we go to our teachers. [Sai]

I think it depends on the person who correct my writing...For example, writing teachers know or strengths and weakness. It's their language. Their correction is like final. On the other hand, my correction or even my friend correction is not as good as teachers'. We are learning, and that why I don't always take mine or my friends' correction. As I said, we are not professional, and we are learning this language. [Nora]

The participants reported that their acceptance of feedback depends on who provides the feedback. They had confidence in their teachers' feedback, but often hesitated to accept feedback from their peers.

## 5. Discussion

The present study explored language learners' perceptions regarding the feedback strategies that best help them develop their writing abilities. Specifically, the study aimed to determine, according to language learners, what types of feedback they find useful in developing their English writing skills. Eighteen ESL learners participated in this qualitative research study. Semi-structured interviews were the primary data source. The findings demonstrate that language learners prefer to receive different types of feedback on their writing, including explicit and implicit feedback. Explicit or direct feedback was seen as providing immediate and effective teaching moments for the participants, whereas implicit feedback helped develop the students' learning autonomy and engagement in the learning process.

Language learners also described the different sources they prefer to receive feedback from (either their teachers or peers). On one hand, teachers' feedback focused more on developing students' grammar, word choices, and writing coherence. On the other hand, peer feedback develops a sense of collaboration among students, which improves their autonomous learning. Finally, the participants seemed to accept or refuse feedback depending on who provided it. They showed signs of confidence in their teachers' feedback but often hesitated to accept their peers' feedback.

Significantly, the study has some limitations. First, the participants included only 18 language learners who were enrolled in intensive ESL programs. The small group of participants reduced the possibility of generalizing the findings to all language classes. Second, the researcher used only semi-structured interviews to collect data. More data methods, such as surveys and direct observation of classes, would have increased the understanding of the participants' preferences and opinions. Finally, the participants included only ESL learners who were studying English in high-intermediate language courses. Involving teachers in this research study would have helped shape a more in-depth understanding of the actual feedback strategies used in ESL classrooms.

## 6. Conclusions

Despite the abundance of research regarding corrective feedback in the ESL/EFL context, few research studies have examined corrective feedback from the language learner's perspective. In terms of revealing what types of feedback ELLs think is useful for improving their writing skills, the present study revealed three main themes and subthemes: feedback provision, different sources of corrective feedback, and feedback acceptance. These themes and subthemes reflect the research questions and identified the most useful and effective feedback strategies that can be used in English writing courses.

Hence, because of its examination of learners' perceptions and preferences, the present research can offer some recommendations related to English teaching and learning. First, more attention should be paid to learners' opinions and preferences regarding the teaching strategies used to develop their

language skills. Involving language learners in the teaching and learning process increases their learning motivation and autonomy. Involving language learners in the teaching and learning process increases their learning motivation and autonomy. ESL/EFL teachers must listen to language learners to discover their teaching and learning preferences (Mao & Lee, 2020; Rafique, 2017). Doing so will bridge the gap between the actual language teaching and students' expectations. This finding resonates with Ferris's (2012) study, which emphasizes the significance of allowing language learners to voice their preferences regarding receiving and accepting writing feedback.

Second, language teachers should work harder to increase students' confidence in their own error corrections and those provided by their peers (Cave et al., 2018). One study finding suggests that language learners tend to refuse their peers' feedback because of their lack of confidence in their peers' language proficiency. Language learners must feel confident in their and their classmates' language abilities, which will increase their motivation to learn (Albiladi & Alshareef, 2019; Fan & Xu 2020; Ferris et al.2013; Huisman et a., 2018; Salinas, 2020).

Third, the findings of this research study emphasize the importance of using implicit feedback to improve language learners' writing. Corrective implicit feedback increases students' autonomy and allows for more self-learning opportunities (Amrhein & Nassaji, 2010; Chong, 2019; Elboshi, 2021; Hyland & Hyland, 2019). That is why language instructors are encouraged to use implicit feedback to develop learners' abilities and skills.

In terms of future research, the present study focuses on corrective feedback from the student perspective. In other words, the study did not identify what types of corrective feedback language teachers find more useful in terms of improving the English writing of their students. As such, more research is needed to explore teachers' perspectives on the most effective types of corrective feedback that can be used to develop students' writing. Exploring these perceptions will provide more insight into teachers' perspectives on the teaching of writing in ESL classes.

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# Marker Approach For Training Case Marker In Kannada Language

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### Abstract

Language is a major tool for an individual to communicate. The phonological & morpho-syntactic components are involved in functions of language processing & executions. Case marker is one of the morpho-syntactic feature, which describes the abstract meaning of the grammatical components of nouns & verbs and in formation of meaningful sentences. Linguistically, case marker is one of the difficult features to comprehend its functions and use in language expressions. There are dearth of studies describing about any specific approach to train the case markers in persons with language disabilities, in regards the present article aimed to develop a comprehensive approach named MARKER approach to train the case markers. This approach planned and developed in improving the language functions & processing skills with respect to information processing model associated with various facilitative skills. It majorly focused on training the case marker morphological principles from concrete to abstract level and its utility in meaningful sentence formations. The present approaches developed are with respect to Kannada cultural & language background, and one can implement similar strategies when working in other languages.

**Key words:** Case marker; Morpho-syntax; Language processing; Language disabilities; Kannada language.

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## 1. Introduction

Language is a system of phonological, morphological, semantic, syntactic & pragmatic rules, which could applied in an orderly manner for communicative purposes (Chomsky, 1957). Language development is a fascinating phenomenon. Language is a major milestone for a child to have some better communication skills, during the process a child would learn all the rules, principles & process the different language components. Children learn language automatically, though there could be variation in the pace of development, there is consensus about how language development takes place. In fact, many theories on language development have been proposed until date.

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Children would predominantly use non-verbal mode of communication during their first year of life. Slowly, by the end of the first year, children start using words and vocabulary starts expanding in the next one year to around 50-150 words. The gestures or non-verbal communication would eventually replace with verbal communication. Whereas, the grammatical feature development takes place between 18-24 months of age. The child would combine subject with verb or verb with object to frame two word utterances. Brown (1973) uses the term telegraphic speech to refer to this stage in language development, as the verbal output comprises of content words only. Around the age of 36-42 months, these phrases increased to sentences of different structures associated with inclusion of various morpho-syntactic features like tense, plurals, case markers and person-noun-gender (PNG) markers.

The case markers described as a formal device associated with a phrase that signals the abstract meaning of a grammatical category of nouns & verbs (Krishnamurty, 2003). The case markers are also been considered as the morphological features and it functions better at syntax level. The case markers assumed to develop by the age of 3-4 years and mastered by the age of 7-8 years (Kumarswamy, 2015 & 2022). It always associates with the relationship between the subject, object, and predicate. Case markers follow the principles of morphology and are language specific. Indian languages have 7 - 8 case markers. The utility of case markers in sentence formation is complex to understand, however it is note-worthy that these care markers used appropriately and effortlessly in spontaneous speech by most of the typical children.

Kannada is a south Indian language used predominantly in the state of Karnataka. It is one among the Dravidian language rich in morpho-syntactic & syllabic features. As far as case markers of this language is concerned, there are eight case markers in this language. The case markers are nominative - /u/ (grammatical case used when a noun or pronoun is the subject of the verb), accusative - /ənnu/ (used to mark the direct object of a transitive verb), instrumental - /inda/ (used to mark the movement 'from' something and/or cause), dative - /ge/ (refers to the object that receives a direct impact on the verb) , ablative - /desejinda/ (applied to a noun, pronoun or an adjective) , genitive - /a/ (usually a suffix added for possession of noun) , locative - /əlli/ (indicates the location) and vocative - /e:/ (a case maker that directly addresses the noun). These case markers are used either in the form of suffixes or post-positions. The instrumental & ablative most often in Kannada language provides same meaning.

Most of the children comprehend & execute these markers via implicit & explicit learning strategies, but still requires, a formal training to learn these case markers as it includes a complex morphological feature principles and its hard process for the children with language disorders to learn to their capacity. Among communication disorders, studies have shown that the case marker majorly affected and considered as main characteristics in differential diagnosing the language disorders especially in cases of Developmental Language Disorders & Specific Language/ Learning Impairments (Sengottuvel, 2013; Tiwari, 2017). A handful studies are also available in children with learning disability (Nag, 2012), Down syndrome (Laws & Bishop, 2003; Perovic, 2006), Hearing Impairment (Medwetsky, 2011) & other language disorders (Chakravarthi, 2012) revealing a major difficulty in comprehending the morphological features. There is scarcity in researches, in development of a therapy model for training the morpho-syntactic skills (specially the case markers) for persons with language disabilities and it is a challenge for the clinician to train & make understand the language principles & process to the client, to bring an effective output. The current study aims in proposing a generic & comprehensive method for teaching case markers in Kannada language in common to any aged & type of language disorders.

## 2. Methodology

The proposed method would to teach case markers is termed as MARKER approach, it highlights on dual modeling of language and cognitive skills improvement. This approach is an amalgamation of bottom-up and top-down model approach, which focuses between meta-linguistic and linguistic skills. The focused skills in MARKER approach includes, Metalinguistic (M), Auditory closure (A), Rainbow coloring (R), Key featuring (K), Expansion, extension & exploring (E) and finally the Rooting (R) skills. Each skill would work with various phases or steps from simple to complex training activities. Activities are concentrated on the language principles and its process involved in communication.

### MARKER APPROACH

(Bottom-Up & Top-Down - Dual Modeling)

**M** – Metalinguistic awareness skills

**A** – Auditory skills

**R** – Rainbow coloring skills

**K** – Key featuring skills

**E** – Expanding, extending & exploring skills

**R** – Rooting skills

#### 2.1. M - Metalinguistic awareness skills

Higher skills of linguistics combined with cognitive strategies would help the client to create, generalize, monitor and to transfer the learnt skills. Meta-linguistic awareness is an individual's ability to focus attention on language as an object in and of itself, to reflect upon language, and to evaluate it. It is consider as a part of meta-cognition, which provides a distinct area of neural spacing ability in each of the individuals' brain to learn the language processing skills. Thinking, reasoning, problem solving, judgment, inference, recognition & recall and working memory plays a major role in improving the abstract language and cognitive processing skills. Working on these skills under the process of case markers principles on following suitable treatment methodology, facilitates the individuals to build an appropriate grammatical & meaningful syntax variants under functional communication (Chermak, 2014; Zwitterlood, 2015). Below are few activities for the clinician that could proceed in training the language process in implementation of cognitive-linguistic skills.

##### 2.1.1. Activity

Clinician could make the client to see to the picture and to read the sentences or clinician could read for the client. Following clinician could ask the client to judge whether the sentences is meaningful or not, and to verify if the grammatical formations are right or wrong (they have to judge if the sentence is matching with the picture or not). If client response is of any type yes/no, later could ask the client to justify & inference his/her responses by providing explanations. Addition to that, particularly if client says 'No', clinician could ask the client to think where it has gone wrong, why it has gone wrong and, what could the possible corrections, and finally the clinician could ask the client to come-up with similar type of sentence examples that had come across in client's day to day communication. To make the client's responses consistent and to learn the morphemic principle at functional level, the skills could work in various phases. One example depicted below; similarly, clinician could work with the other case markers of respective languages.



**Fig. 1:** Activities to improve metalinguistic skills.

### 2.1.2. Phase 1:

Provide this picture (Figure 1), as a stimulus associated with written / verbal utterance of sentences.

Stimulus: S1: /huɖuɖana ɖɪɖa ni:ru ha:kuttɪɖɖa:nɛ/

S2: /huɖuɖa ɖɪɖəɖəlli ni:ru ha:kuttɪɖɖa:nɛ/

S3: /huɖuɖa ɖɪɖəkke ni:rɪnɪnda ha:kuttɪɖɖa:nɛ/

Clinician could ask the client to think, judge & reason out are the sentences provided are meaningful are not and to verify those sentences are matching with the picture or not. If not so, then clinician could ask the child to identify the error in each of the sentences and to come-up with meaningful sentences.

Note: In this phase, the selection of error stimulus could be anywhere in the grammatical category and no correct sentences should be included.

### 2.1.3. Phase 2:

Clinician could provide 3-4 sentences oddity and could ask the client to identify the correct sentence out of them and to infer, justify & reason out his/her responses. In this phase, the selection of stimulus should target only on the case markers not on any other grammatical categories.

Example (ex): 1: /huɖuɖa ɖɪɖəɖəɖəsejɪnda ni:ru ha:kuttɪɖɖa:nɛ/

2: /huɖuɖa ɖɪɖəkke ni:ru ha:kuttɪɖɖa:nɛ/

3: /huɖuɖa ɖɪɖəɖəlli ni:ru ha:kuttɪɖɖa:nɛ/

4: /huɖuɖa ɖɪɖəɖə ni:ru ha:kuttɪɖɖa:nɛ /

Client should be able to select this /huɖuɖa ɖɪɖəkke ni:ru ha:kuttɪɖɖa:nɛ/ as correct sentence, as the morphemic word (case marked) /ɖɪɖəkke/ matches and which gives appropriate grammatical & meaningful context to the sentence compared to other case marked morpho-syntax.

### 2.1.4. Phase 3:

In this phase, clinician could take a single error stimulus and could ask to judge the correctness.

Ex: /huɖuɖa ɖɪɖəɖɪnda ni:ru ha:kuttɪɖɖa:nɛ/

If client finds it difficult to identify the error, then clinician could provide some clue or could directly ask the client to provide the appropriate marker for the root word /ɖɪɖə/. Therefore, client could think, reason out and could match with picture. Once the client comes with correct responses, clinician could ask him/her to give similar example of case marked morphemic word used in daily life conversations.

## **2.2. A - Auditory skills**

Auditory ability is also important for an active listener & communicator. Auditory identification, discrimination, closure, comprehension & feedback majorly focus on the active listening processing skills (Agnew, 2004; Murphy, 2013; Binos, 2021). An activity on closure enhances the discrimination, choosing, preferring, attention & concentration skills. These skills are most need for an individual to develop language components. Since there are 7-8 case markers are present in most of the Indian languages and their meanings are distinct from each other, individual should be attentive in listening & communicate them appropriately. In regards, the auditory skills could be use in training the case markers at reading & listening comprehension skills along with feedback strategies.

### **2.2.1. Discrimination, identification & comprehension skills**

Clinician could implement the process of discrimination & identification under reading and listening activities that improve the client's attentive listening skills and would improve central language process skills.

Reading task: Clinician could provide simple written stories or passages for reading. Later clinician could ask the client to answer certain measures for example; to identify the number of morphemic words; to identify the frequency of occurrence of various types of case markers; to discriminate the meaning of two minimal pair sentences; to explain the meaning of each sentences; and to summarize the story/ passages read to/by the client.

Listening task: Clinician could provide two different sentences (ex: /əruṅa kaijinda ganṭejannu kəṭṭida/ vs /əruṅa kaijiḡe ganṭejannu kəṭṭida/) with change in case marker and could be ask the client to discriminate them with respect to meaning, type of marker & root word. Clinician could also narrate a small story, or read a simple passage, or tell simple sentences and could ask the client, to name few case marked morphemic words that he heard; to provide a similar example of that case marker, and to summarize the story/ passage.

### **2.2.2. Feedback skills**

Clinician could select any one picture card (ex: market) or discuss about any small event (ex: birthday party) or about daily routine (ex: brushing) with client. During this task, clinician could record the language samples of the client and play back the same to the client at the end of the activity, later can be asked the client to listen attentively and to point out the errors in his/her utterance and to correctly rephrase the errors. Clinician could include both the strategies of real time and delayed auditory feedback, correction strategies that are having equal evidences in therapy out-come. This self-feedback skill would help the individual to identify the errors, rephrase the utterance and to maintain the appropriate output.

### **2.2.3. Auditory closure skills**

Clinician could prepare a set of sentences in reference to client's repertoire, and could leave some blanks or add on errors in these sentences that are target as stimulus. Along with this, sentences could be provide with few closures in the bracket, and could ask the client to select the appropriate case markers to complete the sentence meaningfully.

Activity 1: Clinician could give two sentences as closures and could ask the client to match it with the picture provided as shown in the Figure 2.



**Fig. 2:** Activities to improve auditory closure skills

C1: /marəkke uɟa:lejannu kəttɪdda:rɛ/

C2: /marədɪnda uɟa:lejannu kəttɪdda:rɛ/

Activity 2: Could ask the client to read the complete sentences or clinician could read for the client, and later client could ask to fill the gaps with appropriate markers provided in closures.

Ex: /mara \_\_\_\_ (/kɛ/, /ɪnda/, /dəlli/) uɟa:lejannu kəttɪdda:rɛ/ - syllabic closures

\_\_\_\_\_ (/marəkke, marədɪnda, marədəlli/) uɟa:lejannu kəttɪdda:rɛ/ - semantic closures

### 2.3. R - Rainbow coloring skills (Color coding)

Color-coding is one of the cognitive aspects, which facilitate in matching, interpreting and processing any of the stimuli precisely. Combination of cognitive-linguistic skills could improve the individual's memory, selective attention, naming and abstract cognitive skills (Ebert, 2014; Meulen, 2021; Stolf, 2021). In focus to that, rainbow-coloring technique was developed to work on morphing concepts where the rainbow colors are code to each case marker of the respective languages. As each rainbow color is distinct in their appearance, each case marker is also distinct in terms of its appearance & meaning. Hence, these coding used as a cue for the precise selection of case marker in morphing and to use in sentences correctly. Note: Since in Kannada language the instrumental & ablative case markers are, considered similar and providing equal meaning, a single color-coding is considered in this MARKER approach.

Initially, clinician could improve the rainbow color concepts to an individual on regular training. Once client had learnt the vocabulary of rainbow colors, later could create the awareness of color coding skills. Clinician could code the each type of case markers with a rainbow color as a reference and could create awareness to the client, on how to use these markers at morphing process and to use in right place in sentence formation. In addition, certain matching, interpreting and processing activities could be carried out to improve the practice of use of case markers. This activity could improve on syntax drilling, from phrases to complex clause level of sentences.

**VIBGYOR** – u / ənnu / ɪnda / gɛ / a / əlli / e:

#### 2.3.1. Matching activity:

Clinician could ask the client to match the colors with the respective case markers as shown in the Figure 3(a).



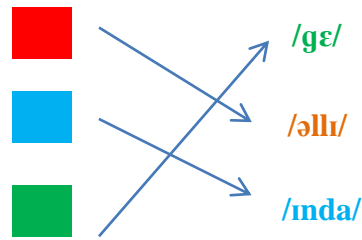


Fig. 3(a): Activities to improve rainbow color coding skills

**2.3.2. Interpreting activity:**

Clinician could ask the client to interpret which color or the marker best suits for the root-word. This could be work at morphemic level or at sentence level (Figure 3(b) & 3(c)).

Ex:	Root-word	-	<b>/pəʈa/</b>
	Morpheme 1	-	<b>/pəʈakkɛ/</b>
	Morpheme 2	-	<b>/pəʈavɛ:/</b>

**2.3.3. Processing activity:**

Clinician could ask the client to use appropriate case marker in the sentence given, provided him/her with color-coded clues to increase the consistent responses.

Ex: Dative (**Green**)  
 / ra:ma ʃitra**kkɛ** bənnə həʃʃidənu /

**2.3.4. Combination of matching, interpreting & processing activity:**

When clinician wants the client to understand the morphing concept and to use the appropriate case markers easily, clinician could give colors to morphs/ markers or could give the color to root word/ picture itself as a cue (Figure 3(b) & 3(c)). This would increases the consistency in client responses. Initially clinician could ask the client to name the picture (ex: root word - /pəʈa/), then can be asked the client to look to the color of the picture and to add the appropriate case marker to it (ex: green: /kɛ/ - /pəʈakkɛ/). Once client learnt the concept of morphing one case marker, then clinician could work with other markers with respective color coded cues. These codes could be provide directly to the picture or could use it as a filler as shown in the Figure 3(c). Following this client could be ask to frame a phrase or a sentence from the obtained morphemic word (ex: /pəʈakkɛ ba:la kəʃʃida:rɛ/).



Root word:	/pəʈa/	/pəʈa/	
Morphemic word:	/pəʈakkɛ/	/pəʈəpəlli/	
Sentence frame:	/pəʈakkɛ ba:la kəʃʃida:rɛ/	/pəʈəpəlli	ɛrəɖu
	gʊʃʃʊgəlivɛ/		

Fig 3(b): Activities to improve rainbow color coding skills



Fig 3(c): Activities to improve rainbow color coding skills

**2.4. K - Key featuring skills (PicSym)**








AAC is one of the ways to improve the communication skills. Even typical individuals are fond of using certain gestures, signs, codes, body language for better outcome of speech act. Thus, it is important even to work these non-verbal skills in therapy where it facilitates the individual to communicate meaningfully. Most of the studies had highlight, that there is an increased effect in language skills on implementation of both aided & unaided AAC strategies in language therapy (Stephenson, 2009; Leech, 2011; Holyfield, 2021). The present approach focused on the use of Picture symbols (PicSym) to explain the meaning of each case marker by featuring with certain key markers of line drawings, icons and pointers. Since certain case markers emphasize about the locations, directions & identities, there is a need of explaining these processes using line drawings / PicSyms.

**2.4.1. Activity**















Clinician could explain the process of how client could understand the concept of case markers on using the PicSyms. For example locations (əlli / mda) are explained by drawing lines as outside / inside directions, and for identities (gə / a / ənnu / e:) drawing line directions addition to central dots, boxes, pointers & encircled lines as shown in the Table 1 & 2. These line drawings can highlighted on pictures/ icons/ orthographies to comprehend faster. Using the below PicSyms chart (Table 1 & 2), clinician could sensitize the client about each case marker & its use in sentence formation as shown in Figure 4. Once the client has able to follow the PicSyms, then clinician could ask the client to use it as a facilitator and to come with appropriate meaningful word & sentences.

Table 1. Case markers PicSym chart on a person

Root word	/ra:ma/	/ra:ma/	/ra:ma/	/ra:ma/	/ra:ma/	/ra:ma/	/ra:ma/
PicSyms							

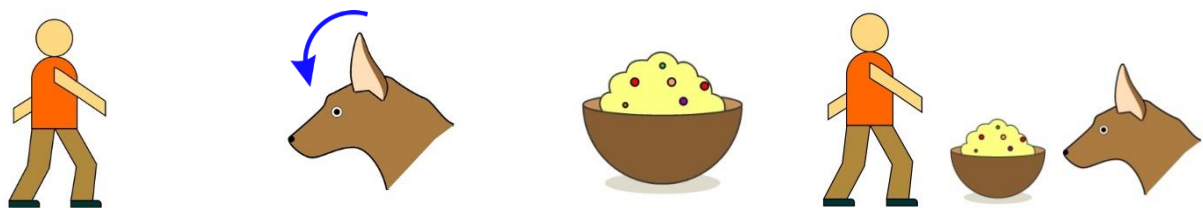
Morphs/ Markers	/u/	/ənnu/	/inda/	/gɛ/	/a/	/əlli/	/e:/
Symbols							
Morphomic word	/ra:mənu/	/ra:mənənnu/	/ra:məinda/	/ra:məniɣe/	/ra:məna/	/ra:mənəlli/	/ra:məne:/

**Table 2:** Case markers PicSym chart on an object

Root word	/mara/	/mara/	/mara/	/mara/	/mara/	/mara/	/mara/
Picsyms							
Morphs/ Markers	/u/	/ənnu/	/inda/	/gɛ/	/a/	/əlli/	/e:/
Symbols							
Morphomic word	/marəvu/	/marəvənnu/	/marəinda/	/marəkke/	/marəda/	/marədəlli/	/marəve:/

Clinician could provide an individual picture card of the target word of a sentence that need to work on in therapy. Following this, could ask the client to name the picture along with clue provided in line drawing and finally could ask the child to come up with a meaningful sentence as shown in Figure 4.

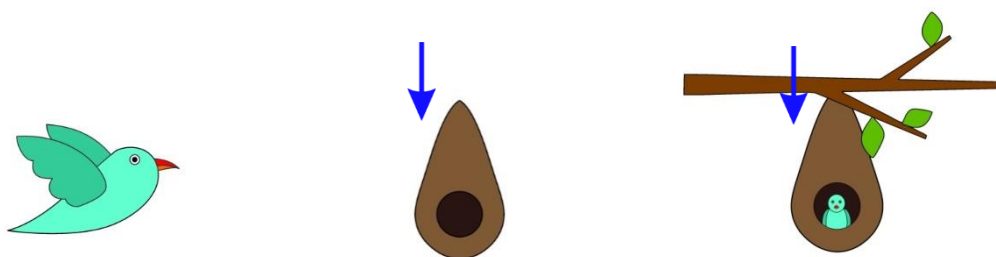
Ex. 1:



Words: /sure:ʃa/      /na:jɣe/      /u:ʃa/      /ha:kida/

Sentence: /sure:ʃa na:jɣe u:ʃa ha:kida/

Ex. 2:



/pəkʃi/

/gu:ɖinəlli/

/va:sisuttide/

Root word	Morphemic principles applied	Action verb
Sentence: /pəkʃɪ gu:ɖɪnəlli vɑ:sisuttide/		

**Fig. 4:** Activities to improve morphing skills at sentence level using picsyms

In this key feature skill, clinician must focus both on markers (morphs) and on the sentence structures (phrases/clauses) associated with the use of picture cards / PicSym chart along with orthographic cues, which improve the stimulability & responses, of an individual.

## 2.5. E - Expanding, extending & exploring skills (Tree branching)

Expansion and Extension are two major components to increase/improve the mean length of utterances of an individual. Expansion focus on increasing the number of morphemic utterances whereas extension focuses on the refining grammatical structure of the sentences. With these two components individual starts exploring in formation of creative, flexible & variety of sentence structures. Hence, it is important to work these components in sentence formations especially in the use of case markers, as it provides more clarification to the meaningful sentences and increase the discourse & conversational skills (Wong, 2012).

### 2.5.1. Activity

Clinician could select one of the case markers and start explaining the meaning of it at morphemic, word & syntax levels. Once the client had learnt the meaning & process of using one case marker, later the skill could be extend to other markers to train at various sentence structuring & formation level. This approach could be work at three phases, Phase 1: concentrated on training the use of markers on sentence grammatical features; Phase 2: concentrated on training the morphemic features and Phase 3: concentrated on training the morpho-syntactic features. Each of these phases worked on formation of subject, object & verb (SOV) components of sentence structures, where Phase 1 focused more on training the S and V with constant O component, Phase 2 focused more on training the O and V with constant S component and Phase 3 provided equal weightage on all the SOV components of sentence structures. In each phase other morphs like tense markers, persons, gender, etc... could also be included for exploring the sentences structures & formations (Figure 5 (a)).

For example; Clinician could take one case marker /inda/, and could create awareness on the meaning of this morph i.e “from that place/ person/ thing” later to use this in a word i.e /ka:rinda/, /ra:maninda/, etc., to use the same words in preparing a meaningful sentences i.e /si:ta ka:rinda bəndəlu/ or /ra:maninda hənnu pəɖɛde/. Once, one example is taught to the client about how to use the morph in creating various sentence formation, later could be use as reference/ base marker and could start working other markers too, as shown in the Fig. 5 (a), (b) & (c). Follow the phases appropriately and work with all possible SOV sentence structures.

### 2.5.2. Phase1: Grammatical features

Here the object (O) would considered as constant, whereas the other components of sentences structures subject (S) and verb (V) would targeted in framing sentences, which are also varied with respect to various grammatical components like gender, persons, tenses, etc...

Initially clinician could teach the use of case marker on sentence formation with an example and could ask the client to use various other words provided in the subject & verb column to come-up with meaningful sentences (Figure 5 (a)).

Ex: /ra:ma fa:leɣe ho:dənu/  
/avəru fa:leɣe ho:dənu/

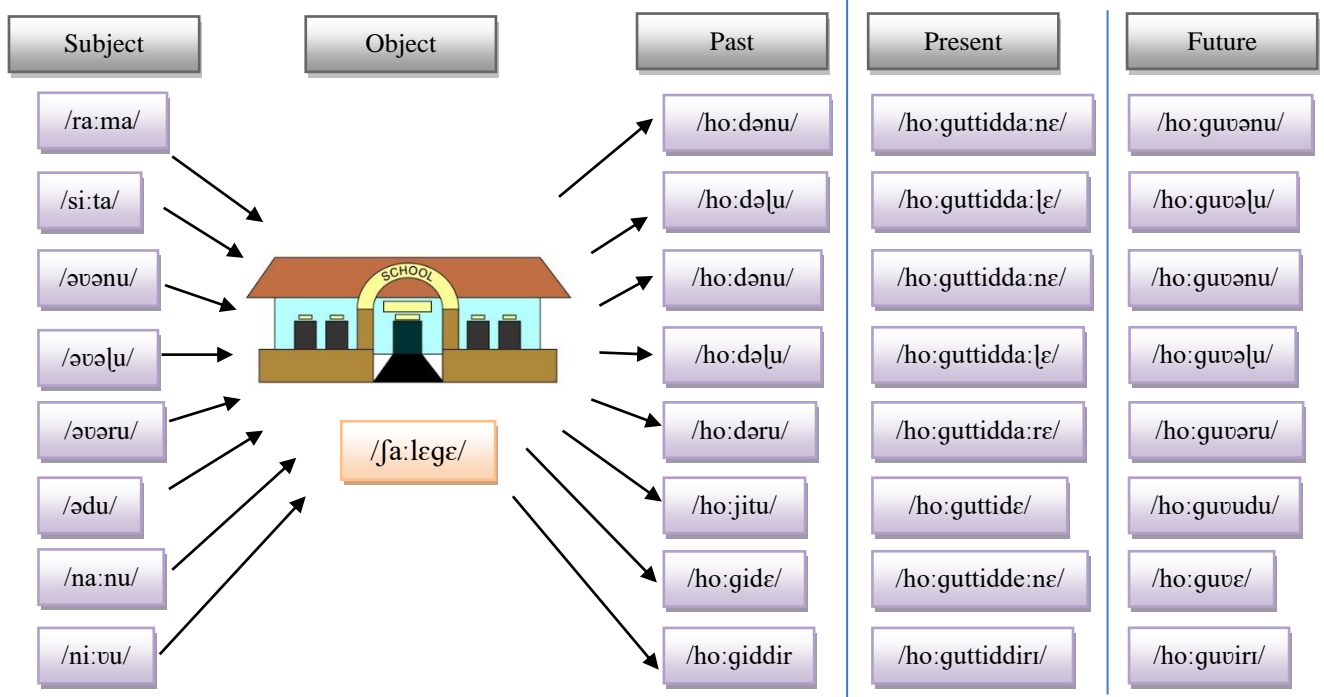


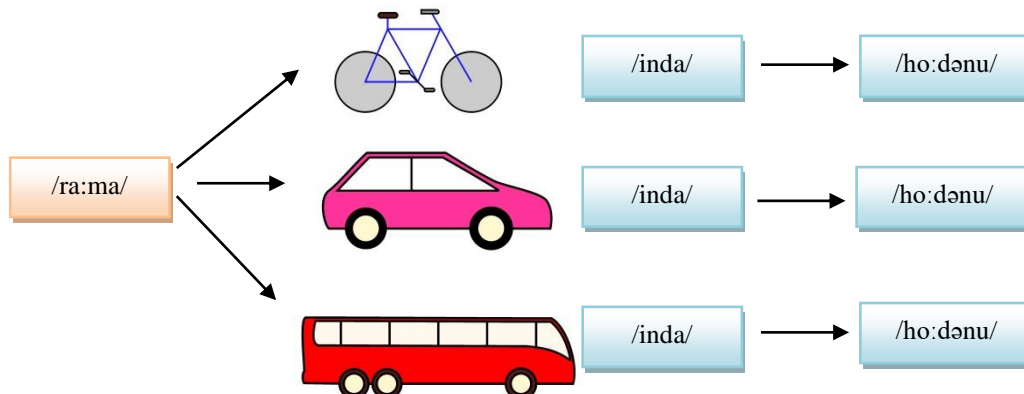
Fig. 5(a): Activities to improve expansion and extension skills at morpho-syntactic level.

### 2.5.3. Phase 2: Morphemic features

Here the object (S) would considered as constant, whereas the other components of sentences structures subject (O) and verb (V) would targeted in framing sentences, which are also varied with respect to various grammatical components.

Initially clinician could teach the use of case marker on sentence formation with an example and could ask the client to use various other words provided in the object & verb column to come up with meaningful sentences (Figure 5(b)).

Ex: /ra:ma bæssinda ho:dənu/  
/ra:ma mi:nənnu ni:rinəlli no:djdənu/



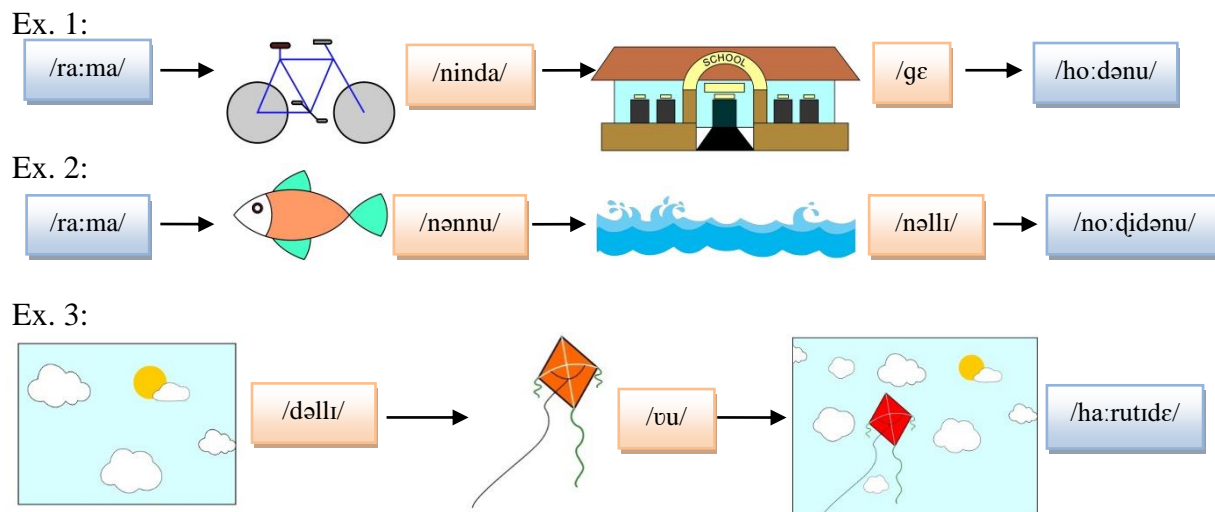
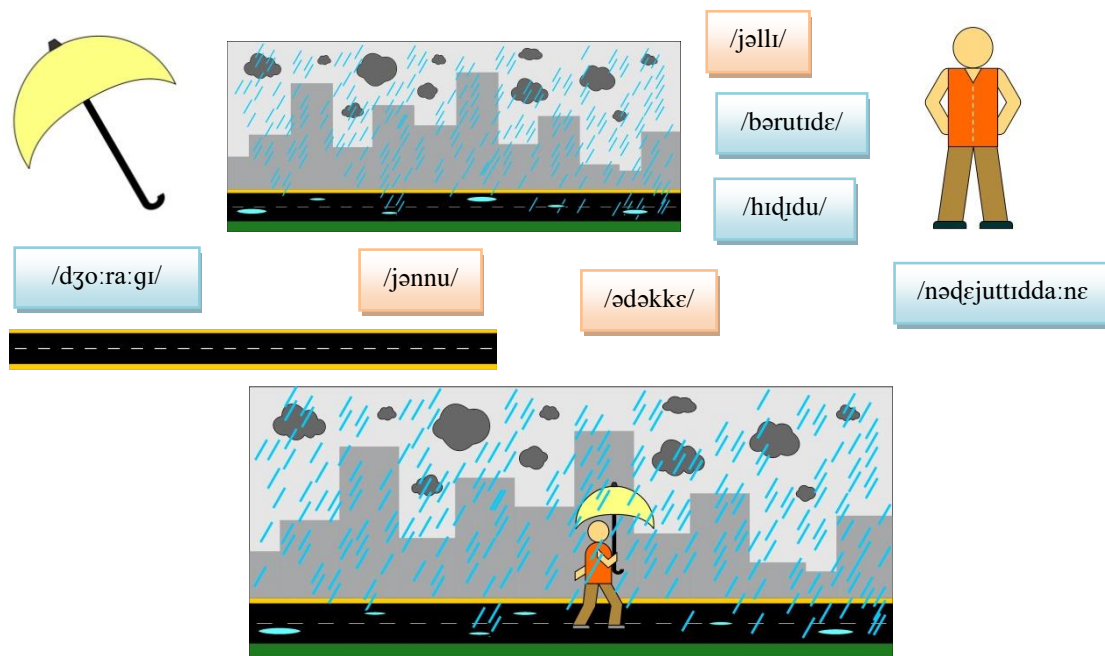


Fig. 5 (b): Activities to improve expansion and extension skills at morpho-syntactic level.

### 2.5.4. Phase 3: Morpho-syntactic features

In this phase, equal importance given to all the components SOV of sentence structure. It is the abstract level, where the learnt concepts of sentence formations from the phases 1 & 2 would explored to various types of the sentences.

Clinician could provide few wordings, picture cards as shown in Figure 5(c) and could ask the client to organize them in an appropriate sentence structure and to frame a meaningful sentence. In between this, the root-word and the case marker should be provided separately, so that client could learn the use of appropriate case marker morphing principle as per to the provided stimulus background.



/dʒo:ra:gi məɭε bərutiɖε əɖəkkε huɟugə [ʃətri:jənnu hiɟiɖu rəstɛ:jəlli nəɟejuttidda:nε/

Fig 5 (c): Activities to improve expansion and extension skills at morpho-syntactic level.

Clinician could use picture cards or the orthographical cards in between the sentence formation, as a cue or as a stimulus card and try to generalize the basic learnt process to abstract level as shown at end of the Figure 5(c). In Phase 3, clinician could work in all possible length of sentence utterances and even at transitive, intransitives, tenses, comparatives, declaratives, imperatives and exclamatory type of sentences. In addition, clinician could select a busy picture (ex: market, zoo, etc.) and can be asked the client to describe about the picture along with conversation, in order to increase the generalization skills.

## 2.6. R - Rooting skills (Tree rooting)

Most of the individual fail to understand the concept of morphs, morpheme and the morphemic principles of a particular language. Individuals find it difficult to transit vice versa between morphs & morphemes and to use the morphemic word in syntax appropriately. Case markers are the morph, works on the principle of inflection morphemes and often used in syntax formation. One must focus on training the case markers associated with language principles (Goodwin, 2010; Tomas, 2015; Murphy, 2020). Hence, this step highlighted the use of root-word that need to be train in morphing with different markers, at phonological & morphemic level than just training semantic vocabulary.

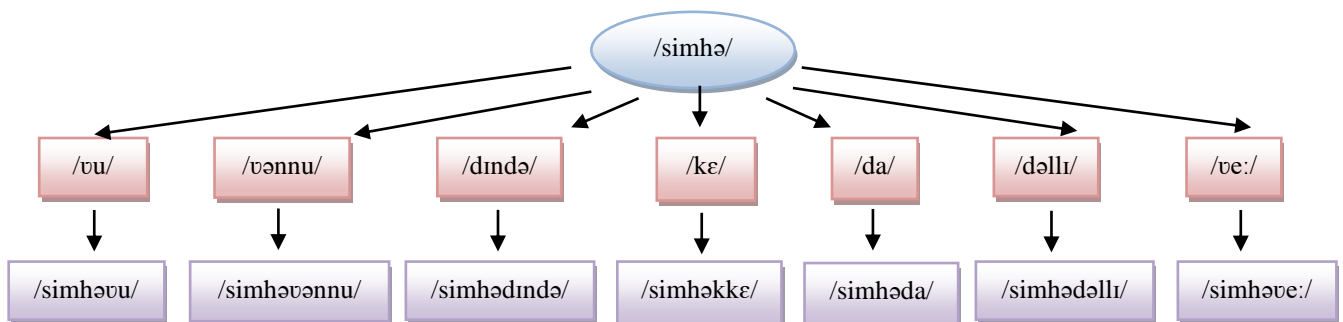
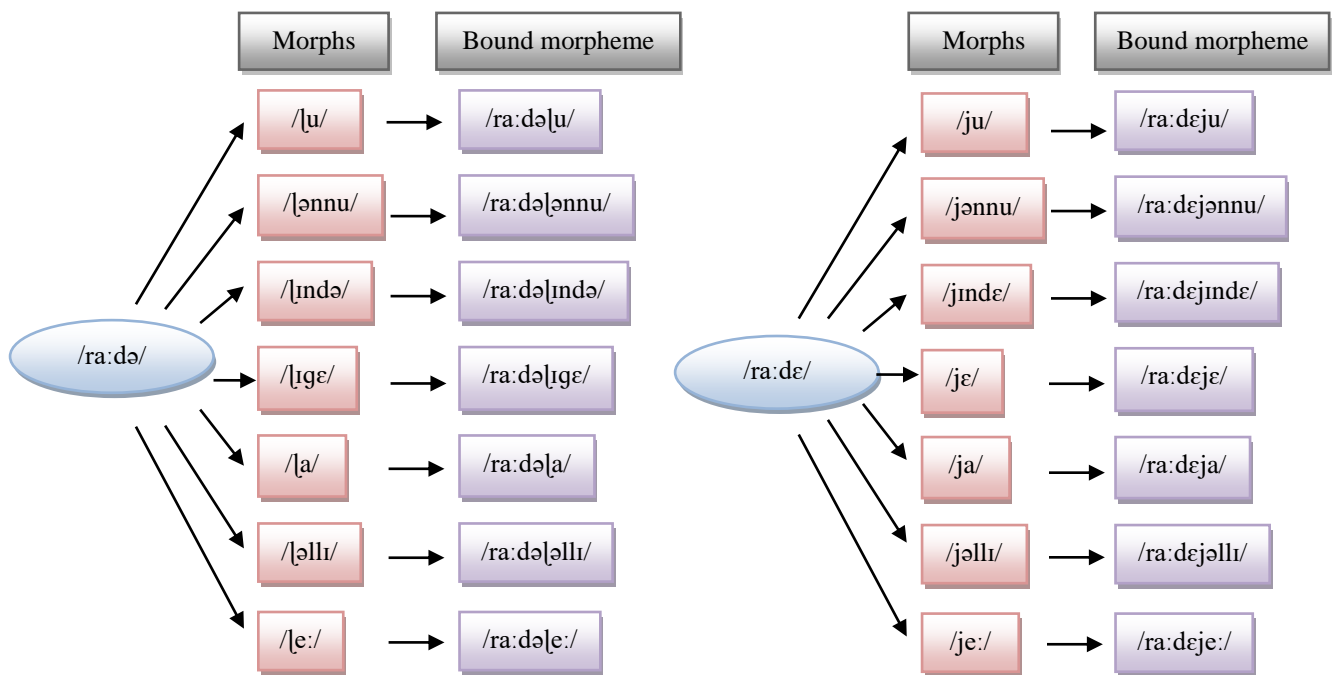
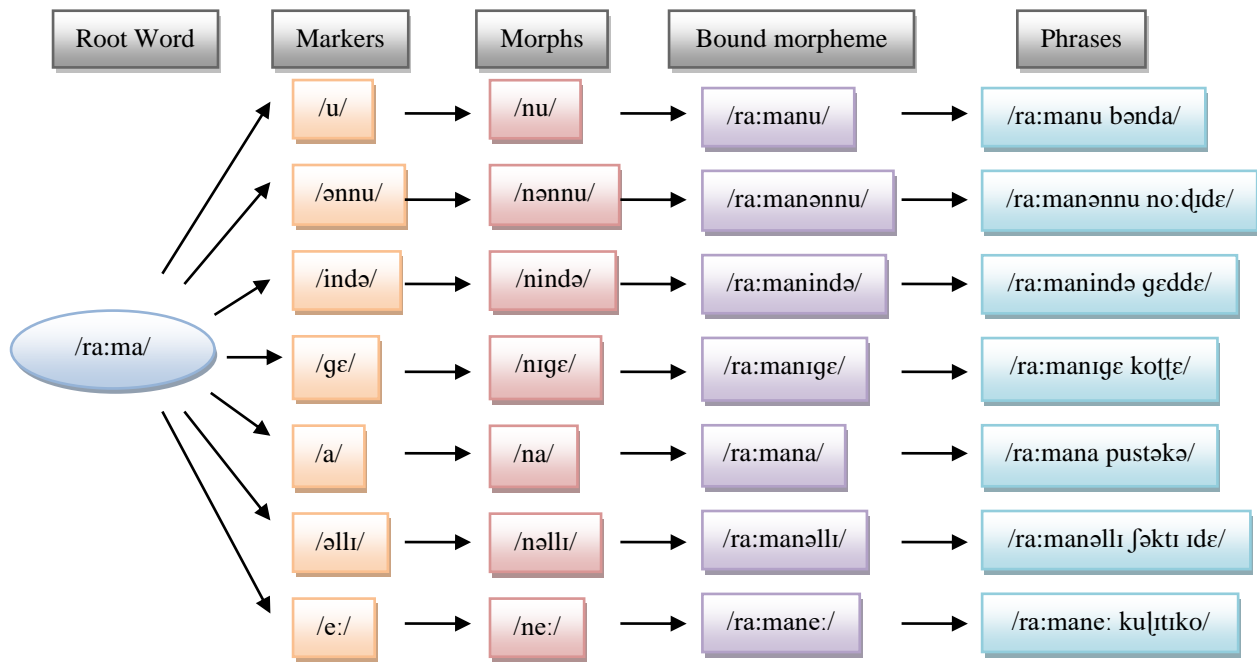
To work on these processing skills, one could select a root-word (noun) - free morph and could ask the client to add those markers to the root word to make it a meaningful morpheme. Clinician could model the client on how to morph a root word transiting to morphemic word, with an example. Once the client had frame a bound morpheme, could create awareness on the new meaning of the word (sensitize on the change in meaning) and to use it in sentences formation (phrase level). This could followed on each marker as shown in the Figure 6. Once the client got the concept of using/ framing the bound morpheme and its use in syntax, then clinician could change the root word to various other grammatical categories like gender, pronoun, proper noun, etc.

### 2.6.1. Activity

Initially clinician could provide awareness & explain about; what the case markers are? how many are there with respective client's language?, how they are different from each other?, etc. (Table 3). Later could select any root word of the language and could ask the client to combine it with case marker & morphs, that provided and to frame a new meaningful word. In between clinician could provide the hint of usage of morphs based on to the root-word as shown in the Figure 6. Clinician could give an example or model the activity and could ask the client to follow the process. Once client constructed a morphemic word, he/she could made to use it in simple phrase level utterance. Clinician could also use picture cards or the orthographical cards to work in the session as shown below. Later clinician could work the same root word morphing with other morphs similarly as shown in Figure 6 (Male: /ra:ma/; Female: /ra:de/; Other: /simhə/).

**Table 3:** Detail description of case markers with examples.

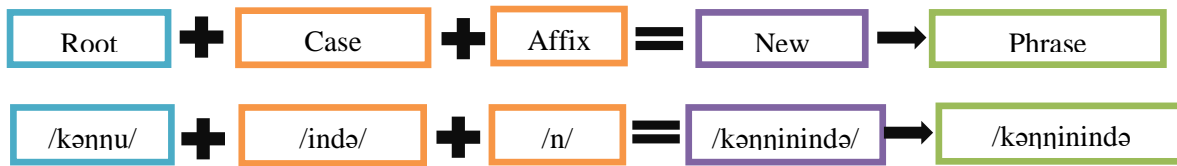
Case Markers	Markers	Description	Examples
Nominative	/u/	Marks the subject of the sentence.	/rameshanu angadige ho:da/
Accusative	/ənnu/	Marks the object of the transitive verb.	/na:nu kaddijannu muride/
Instrumental/ Ablative	/ində/	Marks the movement 'from' something and/or cause.	/su:rjaninda beleku dorejuttade/
Dative	/ge/	Marks the object direct impact of a verb.	/nanage otte hasijutide/
Genitive	/a/	Marks the possession or appurtenance.	/hallija u:ta ruchijagiruttade/
Locative	/əlli/	Marks the location with spatial reference.	/jombinalli niiru kaaljagide/
Vocative	/e:/	Marks the case of addressing a noun.	/gurugale: pa:ta he:likodi/





**Fig. 6:** Activities to rooting / morphing skills at morphemic level.

While affixing a morph most of the times it depends on the category of the root-word, the end of the syllable/ phoneme of the respective root-word and the type of case marker to morphed. For example in case of grammatical noun categories place, animal, things, person and so on, the affixes vary each other (examples given below). In case of root-word of gender category often for male the infix /n/ (/ra:ma/ + /ində/ + /n/ = /ra:manində/) is considered in morphing, similarly in females infix /l/ or /j/ (/ra:də/ + /əlli/ + /l/ = /ra:dələlli/ or /ra:də/ + /ənnu/ + /j/ = /ra:dəjənnu/) is considered and for others infix /v/ ( /simhə/ + /ənnu/ + /v/ = /simhəvənnu/) is considered in morphing (Figure 6) and varies so on with other categorical words. Some time there are no chance of adding an additional infix, but can follow with the end of the syllable of the root-word for morphing (ex: /maisu:ru/ + /ində/ = /maisu:riində/). Considering these principles, one must be aware of the process of infix when morphing a root word.



Place: /kərna:təka/ + /əlli/ + /d/ = /kərna:təkadəlli/; /bətta/ + /e:/ + /v/ = /bəttauve:/

Animal: /kuri/ + /əlli/ + /j/ = /kurijəlli/; /mi:nu/ + /gə/ = /mi:nigə/

Things: /tʃi:lə/ + /a/ + /d/ = /tʃi:ləda/, /pətra/ + /kə/ = /pətrakke/

Plurals: /juvəkəru/ + /ində/ = /juvəkərində/; /həsugə[u/ + /ənnu/ = /həsugələnnu/

It is very important to work at all the possible root-words with regard to noun, pronoun, person, gender, adjectives, action verbs and other grammatical categories. Because, this rooting skills have increased the clients' comprehension & processing skill of morphing to new meaningful words.

Verb: /no:qu/ + /ində/ + /dər/ = /no:qɪdərində/; /oɖɪdə/ + /kə/ = /oɖɪdəkke/

Adjective: /ka:rə/ + /kə/ = /ka:rəkke/; /səppe/ + /u/ + /j/ = /səppeju/

Preposition: /du:ra/ + /əlli/ + /d/ = /du:radəlli/, /pəkka/ + /a/ + /d/ = /pəkkəda/

Not all the markers could be use frequently for the new word formation because it also follows the principles of each language (Kodagunti, 2011). For example /suri/ + /gə/ = /surigə/, this process of morphing can't be accepted, because the root word itself as given clear meaning and the new word formed is non-meaningful in nature, similarly another example /bələpə/ + /desejində/ = /bələpədə desejində/ which is meaningless and frequency of use of this morph to certain root-word in Kannada language are less and unsuitable.

In Kannada language the markers nominative, locative, accusative, genitive & instrumental are frequency usage are higher than dative, ablative & vocative (Kodagunti, 2011). It has assumed that /desejinda/ and /inda/ are providing similar meaning in context and rarely the marker /deseində/ used for persons than to any other grammatical categories. The use of markers /kə/ vs /gə/ would depend on the end of the phon of the root-word i.e., when the root-word ends with phon /ə/ then /kə/ morph is routinely used as case

marker. For example in the root word /pətə/ the end phon is /ə/ now to morph with a dative marker, then would need to select /kɛ/ than the /gɛ/ marker i.e., /pətəkɛ/ (more meaningful) than /pətəggɛ/ (less meaningful). There are chances of morphological marking could be obligatory, and additional morphology (infix) is required in order to achieve the appropriate inflection morpheme (Lidz, 2006; Amritavalli, 2007). Hence, keeping these challenges one must be very much careful in explaining the meaning of these morphemic principles in the training aspects, as it varies with respect to intra and inter language structures & principles.

## 2.7. Implementation

All the steps of the activities could be carried based on International Classification of Functioning, Disability, and Health (ICF) & Evidence-Based Practice (EBP) based treatment model, i.e., client and clinician based training approaches. Clinician could work from Meta-linguistic (M) to Rooting (R) (top-down approach) or from R to M (bottom-up approach) but should be aware of child's need & the level of processing skills. Each of the steps and approach could work in more creative manner with various stimulus materials not confined to verbal, but extended to visual, tactile & other sensory modalities. Clinician could proceed to the next level / phases / skills only if the child has achieved equal and above 80% of consistent responses in each of the levels of the MARKER approach. Make sure the stimulus selection should be based on child's age, gender, intellectual quotient, living environment, and speech-language processing skills.

Similar methodology can be carried out by parents at home, considering the stimulus of daily day activities, so that the child can generalize the learning skills. It is better to train the individuals with increased stimulability at visual, auditory and orthographical stimulus. Make sure even the feedback mechanism provided regularly to maintain the consistent output responses and responses could be improved by providing appropriate clues and prompts. Most of the time the behavioral changes are very flexible in case of children, so to maintain the desired behavior, the conditional, operant and the observational behavioral strategies can be implemented along with the MARKER approach, which also facilitates in improving the child's overall language skills. A well-planned treatment design should be implemented in the sessions with appropriate reinforcement strategies and documenting the client response is an important etiquette. Let the motto be, to improve the quality not just the quantity of life of an individual.

## 2.8. Applications

All the activities in MARKER approach planned and developed with respect to all possible languages, situation, places, age, and individuals' capacity & in various setups. This approach focused on specific to linguistic form i.e., phonological encoding, morpheme and morpho-syntactic skills, which involved the complex process in language formation than other components of semantics & pragmatics. Most of the individuals with language disorders learn the semantic components easily and will have difficulty in comprehending morpheme principles & sentence structures. In addition, they lack in comprehending the formation, process & language principles, as seen in Learning Disabilities, Specific Language Impairment & Developmental Language Disorders. As a solution, the MARKER approach provides a spatial sketch & a mind map of, language comprehension, processing, formation & an execution skill and helps in improving the language developmental skills in persons with communication disorders.

Since the MARKER approach is sensitizing on higher language & cognitive skills, non-verbal communication skills & auditory skills, the approach could also use to train other communication disorders like Intellectual Disability, Autism Spectrum Disorder, Hearing Impairment, Neuro-developmental Disorders and so on. The approach won't differ much with cultural and linguistic background as it is focusing more on the language functions & processing skills than on structures, easily clinicians can work these skills even in other languages too and can see the efficiency of the approach. If clinician wishes to include any other approaches working for language components in combination with MARKER approach, it is appreciable, as it known factor that holistic approach leads to effective treatment.

### 3. Conclusion

MARKER approach is a newly proposed program for training the case markers and other features of morphology & syntax of a language. It aimed at improving the language functions and processing skills between the central-peripheral and concrete-abstract levels using certain facilitative skills. The facilitative skills are, Metalinguistic awareness skills, Auditory skills, Rainbow coloring skills, Key featuring skills, Expanding, extending & exploring skills, and Rooting skills. This approach planned based on bottom-up, top-down and dual model approach to work more on parallel distribution processing abilities. The treatment approaches developed in native language & cultural background, and one can implement the similar strategies when working in other languages. However, this re/habilitation approach focused on a client & clinician-based approach, it holds the essence of evidence-based practices, which need be validate in future research studies.

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## **Impact Of B-Learning Supported By The Flipped Classroom: An Experience In Higher Education**

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### **ABSTRACT**

The objective of the study was to identify the impact of B-Learning supported by the Flipped Classroom on the learning and development of competencies, carried out in an academic program of a university institution in Colombia. A quantitative approach was adopted, with a descriptive scope and a non-experimental design. The study was carried out with 40 students during the first semester of 2022, to analyze and compare their performance in a virtual platform and their percentage evaluations in a pretest and post-test, through the calculation of Hake's learning gain. As the main result, the role of the teacher as a facilitator and guide is evidenced, and the student's participation in teamwork. It is concluded that the use of B-Learning supported by the Flipped Classroom is a viable alternative to apply in higher education subjects because it strengthens learning and develops various competencies in students.

**Keywords:** inverted classroom, hybrid learning, mathematics, virtual platform.

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### **INTRODUCTION**

The educational system at all levels faces great challenges and changes, but at the higher education level, it is necessary to analyze the advances and transformations it has gone through for the formation of digital competencies and how to face the demands of society to establish models and methodologies that facilitate the adoption of knowledge, according to current trends (Gamboa, 2022;

Bernate & Vargas, 2020; Chaparro et al., 2018). As Information and Communication Technologies (ICT) evolve, so does education through their curricular integration (Ortíz-Arismendy et al., 2019; Claro-Vásquez, 2017), so a conceptual approach from this point of view, is that of being a set of tools and resources that stimulate and contribute to the dynamic interaction between individuals, thus facilitating learning and the dissemination of knowledge (Rodríguez et al., 2021; Ortega et al., 2019; Díaz-Padilla, 2017). The problem with ICT is that on many occasions teachers do not know how to implement them in their pedagogical practice, because they lack the basic competencies necessary for their use (Hernández et al., 2019; Prada et al., 2019; Hernández-Suárez et al., 2018). Therefore, the development of digital (or ICT) competencies of teachers not only allows them to implement technologies correctly in the classroom, but also to develop them in their students (Adoumieh, 2021; Rodríguez, 2018; Contreras-Colmenares & Jiménez-Villamarín, 2020; Hernández et al., 2016; Hernández et al., 2016).

It is in this scenario where ICTs enter the educational environment, classified with different terminologies according to their orientation towards uses such as learning (Learning and Knowledge Technologies or LKT), participation and teamwork (Empowerment and Participation Technologies or EPT) and social relations (Relationship, Information and Communication Technologies or RICT) (García & Fernández, 2017; Nieto & Vergara, 2021; Avalos et al., 2021), to orient them towards use in a formative and collaborative way, both for the student and the teacher (Prada et al., 2019).

Therefore, each of these approaches to technology applied to teaching and learning plays a distinctive role, which allows understanding that the scope and purpose of these tools are not necessarily the same (Rodríguez et al., 2021; Espinel-Rubio et al., 2020). That is, ICT alone does not contribute by itself to the formative and collaborative development of students, but it is the teacher's role to reorient towards these approaches (LKT, EPT and RICT), and thus achieve autonomous, meaningful and collaborative learning in the student (Pérez et al., 2022).

Within this ICT (LKT, EPT and RICT), the Virtual Learning Environments (VLE) are developed, which help to strengthen learning in different areas of knowledge through interaction between students and teachers asynchronously or synchronously (Contreras-Colmenares, & Garcés-Díaz, 2019). In this sense, online education (virtual or e-learning) uses any digital device. Likewise, hybrid learning or blended learning (b-Learning) is another training modality that combines online and face-to-face education. Both modalities are part of the training offered by universities to strengthen the educational process and seek to break space-time barriers. In this sense, the incorporation of ICT in the field of education has been gaining importance and evolving over the last few years, since its use in the teaching process has gone from being a possibility to establishing itself as a necessary didactic tool in the improvement of the quality of the teaching-learning process for both teachers and students (Hernández-Suárez, 2020).

On the other hand, the usual training model in classroom subjects, which has been used for decades, is called the traditional model. However, in recent years it is possible to identify the inverted classroom as a model that contrasts with this traditional scheme. Its origin dates back to the 1990s, from focusing on the importance of the use of class time to consolidate knowledge instead of the transmission of information (King, 1993). Although it does not directly illustrate the concept of



“inverting” the classroom, it promotes the investment in the educational space for active learning. In addition, the strategy called “peer instruction” is developed that involves “inverting” the traditional classroom by transferring information outward and bringing the assimilation of information into the classroom (Mazur, 1997). Finally, Walvoord and Johnson (1998) offer the first outlines of this approach, although without making an explicit reference to it. Starting in 2000, terms such as “Inverted Classroom” (Lage et al., 2000) and “Classroom Flip” (Baker, 2000) began to be coined, in which the inversion of place between the two main activities of the traditional model is proposed: classroom explanations and homework at home. The expression and the model were consolidated in 2007 with the proposal of Bergman and Sams (2012).

The central aspect of these models is that lectures are replaced by videos, readings or any other material (either physical or preferably virtual, available on some platform) that the student can do independently outside of class, and the classroom space is transformed into a meeting place where collaborative practical activities are carried out. A general component of these models is that their application requires a major organizational change in learning. As such changes are not easy to make, it requires a great effort on the part of the teacher to invert a traditional face-to-face subject. In this sense, the inverted classroom is a novel strategy that due to the period of non-face-to-face caused by Covid-19 began to be implemented to complement the teaching-learning processes during this period, having a very profound impact on teachers (Hernández-Suárez et al., 2022).

Conceptually, the inverted classroom is a modality of B-learning, because it combines face-to-face and virtual methodologies through the use of technologies (Salinas et al., 2018; Morán, 2022). Therefore, they seek to empower students in their formative process and have greater possibilities to take advantage of the information on the web, through educational platforms, and face-to-face meetings, to develop better learning (Prada et al., 2019; Hernández-Suárez et al., 2020).

Finally, the use of educational platforms is very diversified. One of the most widely used is Moodle, a Learning Management System (LMS) characterized by being modular, usable on any device and with the possibility of integrating various tools to guide learning in virtual courses, individually or collaboratively (Rizales-Semprum et al., 2019; Hernández et al., 2021). Several studies have analyzed their impact and formative advantages, as well as the impact of the feedback offered on student motivation (Prada et al., 2019).

In 2016, the Universidad Francisco de Paula Santander (UFPS) Cúcuta-Colombia campus began to implement in Moodle the Teaching Support Platform or PLAD (In Spanish, Plataforma de Apoyo a la Docencia) to support students' independent work, which was extended to many subjects as a result of the educational emergency due to Covid-19 (Prada et al., 2022). Since the return to face-to-face, many teachers started to use the Flipped Classroom to support their pedagogical practice in directing face-to-face work. The study material is very explicit, and should not only use a presentation but on the contrary should seek to combine audio and video elements to give greater clarity to the subject, which should be previously available on the virtual platform not only for a class session but also as reference material, and finally, the classroom is where the combination of the above attributes is carried out and where ideas and concepts should flow, thus achieving a mixture that helps the student to confront what has been learned, apply and from the knowledge acquired, create the concepts

necessary for their training.

Finally, most of the studies on the flipped classroom are based on determining the perception of the usefulness of the model in both teachers and students (Hernández-Suárez et al., 2022; Hernández-Suárez et al., 2022), with very few studies on its impact on learning. Therefore, this study is conducted with higher education students applying the Flipped Classroom model together with Moodle-based LMS through B-Learning-based intervention, whose objective is to determine the impact of B-Learning supported by Flipped Classroom on learning and competency development. Specifically, it is intended to assess its usefulness in a subject of a teacher training program, as well as to examine the level of student participation in the Moodle-based LMS called PLAD, by reviewing the scores obtained in each face-to-face and virtual training activity.

## **METHOD**

### **Type and design of research.**

The methodology was quantitative under a quasi-experimental pretest-posttest design, with a descriptive scope, using a single group to which a pretest is applied, then the intervention is applied and finally, the results of the application are analyzed through a posttest.

### **Population and sample.**

Forty students from the Bachelor's Degree in Early Childhood Education academic program who took the subject Quantitative Research under the B-Learning model supported by the Flipped Classroom, during the months of February to April 2022, were considered. The selection of the participating groups was by convenience, according to the availability of the teachers interested in participating in the study.

### **Instruments and data collection.**

Two knowledge tests were used for data collection: a diagnostic test at the beginning of the course and a mid-course test. The first one contains 15 questions and the second one contains 30 multiple-choice questions, both with four answer options. Both tests were elaborated by the researchers with a coincidence of topics in both of them of 85%, this because the diagnostic included questions from the second part of the course. The knowledge tests were applied in class sessions using the PLAD.

Reliability was calculated using the K-R20 coefficient, obtaining the following values for the pretest (0.56) and posttest (0.77), which according to Ruíz (2002) correspond to moderate and high reliability, respectively. To accept the moderate reliability in the pretest, it was verified that the standard error was less than the total standard deviation.

### **Description of the experience.**

For the online component, the PLAD contained general and specific information about the course and each topic, with information (videos and documents) and interactive questions that could be reviewed several times, a quiz per lesson with 10 random multiple-choice questions, from a question base of 50 items, a ranking of students through a badge module for each test passed.

In addition, activities were created for students to work on the PLAD and collaborative activities were designed to be done during the lessons in a Shared Work folder in Google Drive.

The videos used contain the explanation of the theoretical foundation and its procedure as well as some questions to be answered by the students before the class, which also functions as an evaluation mechanism. The videos were uploaded to PLAD through a Youtube channel. Regarding the duration of the videos, care was taken that the videos did not take more than 10 min (in some cases, it was not possible), to prevent the student from losing interest due to their duration. However, each of the videos should have complete information, so that the students could study and perform the exercises without any inconvenience. This was a challenge for the teachers, who had to be very concise and brief during the instructions. The videos were recorded without students to avoid unforeseen events and interruptions.

For the face-to-face work, each session lasted 4 hours (2 for direct work and 2 for tutoring) and the following was addressed: verification of online learning through strategies for recovery of prior knowledge and organization (Morales, 2009), adding elements of gamification through team competitions, implementation of application, analysis and synthesis activities, using various resources, and metacognition with the sharing of class learning (Prada et al., 2021). Under the inverted classroom approach, students are grouped into teams, doubts are solved, exercises are performed in the Drive folder and the different groups correct the exercises among themselves, making a presentation. The teacher's role is that of advisor and evaluator. He is in charge of checking if the students carry out the procedures described in the videos, correct them if necessary, resolve doubts and evaluate skills.

### **Information analysis.**

Finally, the results obtained from both tests and the average obtained in the PLAD were organized in a database. The learning gain from one test to the other was calculated. Comparative graphs were also constructed for analysis.

## **RESULTS**

The learning gain was calculated using Hake's factor ( $g$ ) (Hake, 1998) to determine the level of achievement of conceptual learning after the application of the B-Learning model supported by the Flipped Classroom, that is, with the results of the pretest and posttest, the impact on the assimilation of conceptual knowledge is determined.

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$$g = \frac{\text{Posttest}(\%) - \text{Pretest}(\%)}{100 - \text{Pretest}(\%)}$$

In addition, the value of  $g$  can take values between 0 and 1, where 0 represents the absence of learning, while 1 corresponds to the maximum possible learning. For this purpose, three categories are established for the normalized average gain, which indicates the degree of effectiveness of the Flipped Classroom model, supported with the PLAD, high ( $0.7 < g \leq 1$ ), medium ( $0.3 < g \leq 0.7$ ), and low ( $0 \leq g \leq 0.3$ ).

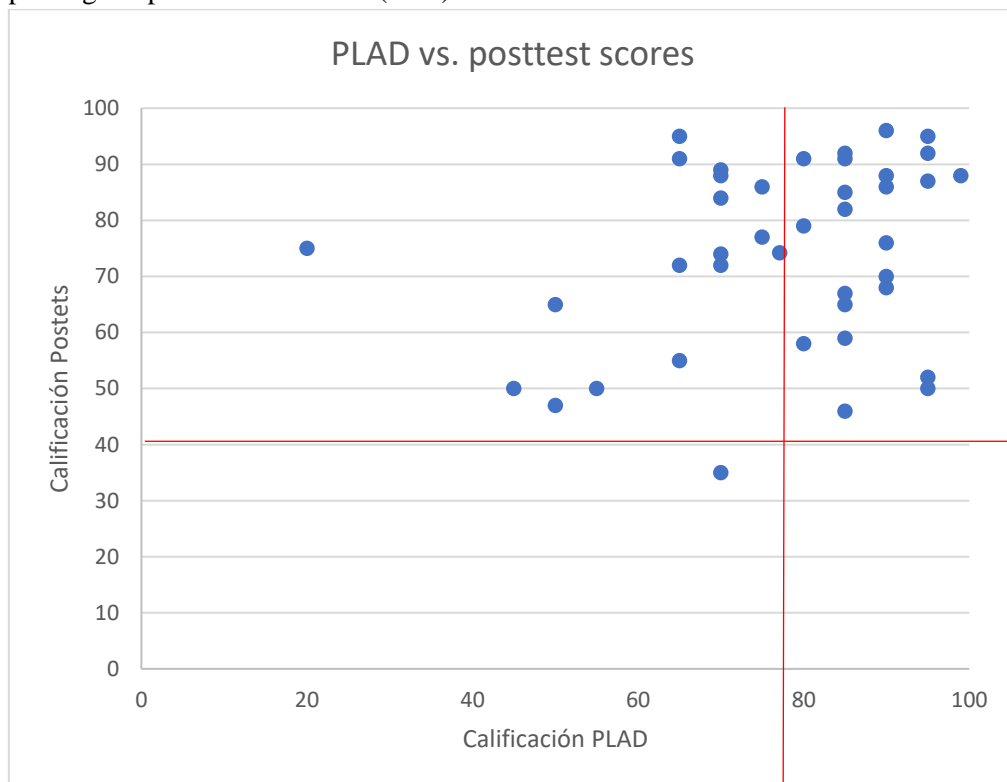
According to Hake (1998), the target group obtained an average learning gain (Table 1).

**Table 1.** Learning gain

Group (Students)	Pretest Average (%)	Average Posttest (%)	Average PLAD (%)	Hake Index (Pre-Post)	Hake Index (Pre-PLAD)
40	59.3	74.2	77.1	0.37	0.44

According to Table 1, it can be observed that the percentage of students who passed the post-test performed well in the PLAD and that their averages are very close to those of students who passed the post-test.

Considering the learning gains in Table 1, it can be verified that the low learning gain may be due to the lack of commitment to the development of the proposed activities. Although it can be evidenced that students who had failed the diagnostic and who were committed to the work, increased their performance both in the post-test and in the PLAD activities. In addition, it is observed that the average in PLAD seems to be associated with a higher learning gain, so the dispersion of grades in PLAD was plotted concerning those of the Posttest. Figure 1 shows a higher percentage of students passing the posttest and PLAD (70%).



**Figure 1.** Dispersion of PLAD and Posttest scores.

According to Figure 1, the agglomeration of scores in the quadrants of those who passed the PLAD and the post-test is noteworthy. This consideration supports that the low learning gains were because some students were not fully engaged in their formative process.

**DISCUSSION**

The inverted classroom as an educational approach managed to reduce the theoretical sessions of the classes to allow working with practical activities, and the use of the PLAD allows the teacher to have a compilation of evaluation results before the class, which has allowed reinforcing the concepts in which the students' results showed a lower grade, and to follow up on the student's progress by providing feedback. It has also allowed for online and autonomous learning, guided by teacher feedback. In other words, with the implementation of B-Learning supported by the Flipped Classroom model, it is possible to reduce theoretical sessions to give way to practical activities in the classroom, as has also been evidenced in studies such as those of Yaroslavova et al. (2020). By giving more importance to practical activities and more autonomy to the student, he/she becomes better organized and improves his/her participation skills and the ability to come up with alternative solutions.

The above implies knowing, understanding and mastering the basic aspects of ICT from different perspectives: technological, social and communicative (Mascarell, 2019) where from the TEP they imply the use of technologies towards participation and personal fulfillment and that through the TAC making a good technological use enable meaningful and autonomous learning, as well as the development of competencies (Paniagua, 2022), to favor it through the participation of the same, thus enhancing a social character in the classroom, as promoted by the RICT.

The results allow verifying a considerable, but undesired, learning gain. Arias-Rueda (2021) explains that the Flipped Classroom model, when applied in virtual mathematics classes with interactive videos and review activities with immediate feedback, contributes to student participation in their learning processes. According to this, the Flipped Classroom supports the student's commitment to their training, so it was found that those who performed the activities in the PLAD achieved better results in the class exams, but one of the difficulties that were evident in the process was the progress in the topics, without sufficient feedback of the topics seen.

Analyzing student participation, it was verified that González & Huerta (2019), conclude that regarding student motivation concerning the inverted classroom model its success depends on the direct and continuous collaboration of the student to verify the constructivist principle of learning by doing (Hernández-Suárez et al., 2020), which encourages active learning (Prada-Núñez et al., 2021). This is evidenced by the fact that students who failed the diagnostic increased their performance. This coincides with Mendaña-Cuervo & López-González (2021), who explain that the academic performance of students who have been subjected to the inverted classroom methodology is higher than that of traditional classroom students. In addition, when the flipped classroom is supported by B-Learning, the student has an active role that allows the development of competencies and self-learning (Prada Núñez et al., 2021).

Finally, students who participate in Flipped Classroom find greater motivation to learn, and, consequently, they achieve the development of more complex skills, such as applying, analyzing, evaluating, and creating among others and that was given because of the available material (videos and lessons) favored student-learning object interactions (Hernández Suárez et al., 2021).

## CONCLUSIONS

A didactic experience has been designed and implemented in a teacher training program, and it has been taught in the B-Learning modality supported by the Flipped Classroom model together with the application of active work methodologies that encourage collaborative work and the use of ICT such as LKT, EPT and RICT. With this approach, student learning improves in the traditional classroom, as long as there is adequate curricular planning for the moments before the class (virtual) and face-to-face in which student activity and student-teacher interactions are guaranteed, to facilitate active learning. That is to say, it was evidenced that students with a low performance benefit from the inverted classroom when they work in it. Accordingly, it is concluded that the inverted classroom in its different moments positively impacts performance, but those who actively participate have a better performance. Finally, students and teachers find PLAD a platform under the principles of the flipped classroom, as a suitable environment for the development of the teaching-learning-assessment process.

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## The Syntax Of The Wh-Subject In Ha'il Arabic

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### Abstract

This article aims to investigate the syntax of the Wh-subject in Hail Arabic (HA), a dialect spoken in the north Najd region in Saudi Arabia. It employs Chomsky's (2000, 2001) feature-checking theory and Rizzi's (1997) Split CP hypothesis. This paper demonstrates that the wh-subject can appear in three positions: the specifier position of Tense Phrase [spec, TP], the specifier position of Finiteness Phrase [spec, FinP], and the specifier position of Focus Phrase [spec, FocP]. The study addresses the following question: how is interrogation licensed while the subject is in [Spec, TP] or [Spec, FinP]? To answer this question, I assume, following Gad (2011), that interrogation is licensed via LF movement of an operator [Op] that bears a strong [wh] feature. This operator moves covertly to [spec CP] to license interrogation. I assume that the complementizer *illi* 'that' heads the FinP. It bears an EPP feature that attracts the Wh-subject adjoining its Spec position. I also claim that pronouns such as *hu* 'he' head the FocP. The study, adopting Chomsky (2000, 2001) feature-checking theory, claims that the focus head establishes an Agree relation with the goal that carries a matching unvalued [Foc] feature, valued [Wh] feature and valued phi-features. The study also demonstrates that the Wh-subject may occur in a final clause position preceded by *illi*-clause. I account for this phenomenon by assuming that the whole FinP headed by *illi* moves to the specifier of the upper Topic Phrase while the wh-subject remains in [spec, FocP].

**Keywords:** Hail Arabic; Focus Phrase; Topic Phrase; phi features; wh-subject

### 1. Introduction

The syntactic analysis of wh-questions has drawn the attention of many linguists. Numerous studies have been conducted to examine the syntax of wh-questions within Chomsky's (1981-1991) Government and Binding (GB) theory and the Minimalist Program (MP) (1995-2001). For example, Cole and Herman (1998) investigate the Malay typology of wh-movement. Within an earlier version of the minimalist framework (Chomsky 1995), they investigate the principles governing overt wh-movement, partial wh-movement as well as wh in-situ.

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The formation of Subject wh-questions is an intriguing phenomenon that raises challenging questions to the core of the Move approach within the Minimalist Program (Chomsky 1995). These questions include 1) “Do wh subjects move overtly or at LF? And 2) “How does syntax derive wh-subject movement since there is no overt displacement or auxiliary inversion?” (Alshammari, 2018, p.1). In this regard, Chomsky (1986a) hypothesized that Wh-movement occurs in questions except subject questions which remain in-situ (i.e. don’ move).

The paper is organized as follows. Section 2 reviews earlier works on wh-questions in English and Arabic. Section 3 introduces the theoretical frameworks utilized in this study. In this section, there are two parts. First, it offers a brief background on Chomsky’s (1995) Minimalist Program (MP). Second, it discusses Rizzi’s (1997) split CP hypothesis. Section 4 gives a brief introduction of Hail Arabic. Section 5 contains the discussion and analysis. It is divided into three subsections. The first part shows the possible positions in which the subject might occur. The second and third part demonstrate how the wh-subject is formed and how it is derived. Syntactic analyses of wh-questions in HA are based on Chomsky’s (2001) feature checking theory and Rizzi’s (1997) split CP hypothesis. Section 6 summarizes and concludes the paper.

## 2. Literature review

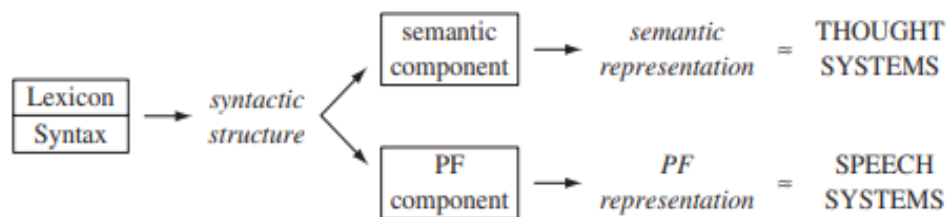
Chomsky’s (1977b) seminal work about Wh-movement sparked a number of cross-linguistic studies on the syntax of wh-questions. For example, Grewendorf (2001) explores the multiple wh-movement in Bulgarian. He claims that the overt multiple wh-words moves as a wh-cluster to [spec, CP]. Also, Khomitsevich (2009) investigates long-distance wh-movement in Russian. She argues that in Russian, unlike English, T but not C is a phase head. Many researchers have investigated the syntax of wh-questions in Modern Standard Arabic (MSA) and other Arabic varieties spoken throughout the Arab world. For instance, Alotaibi (2013), Al-Shorafat (2013), Al-Sager (2017), and Fasih (2007a, 2007b, 2012) explore the syntax of wh-questions in Standard Arabic (SA). Al-Shorafat (2013) and Al-Sager (2017) base their analysis of wh-questions in SA on Chomsky’s (2001) Phase theory. On the other hand, Alotaibi (2013) investigates the derivation of wh-questions in MSA within the minimalist framework (Chomsky 1998, 2000, 2008). He assumes that non-subject wh-items raise to [spec,FocP], whereas the wh-subject word is base generated in [spec,TopP]. Fasih (2012) claims that the wh-phrase in SA does not remain in-situ but it moves overtly to [Spec, CP]. There have been many works that address the phenomenon of wh-movement in different Arabic varieties. Among these studies are the following: Sulaiman (2016), Syrian Arabic; Taha et al., (2016), Sudanese Arabic; Almomani and Alsaidat (2010), Jordanian Arabic; Gad (2011), Egyptian. Furthermore, several accounts have been made to investigate wh-questions in Saudi dialects. In Najdi Arabic, for example, Alshammari (2019) addresses the issue of conjoined wh-questions. On the other hand, Alshammari (2018) investigates the syntax of wh-subjects in the shammari dialect of Arabic (SA). He provides empirical evidence that the wh-subject undergoes an overt movement to [spec,CP]. Fasih (2014) and Mushait (2019) explore the syntax of wh-questions in Najrani Arabic. Following Gad (2011), Fasih (2014) assumes that the focus phrase is headed by *illi* ‘that’ that forces the wh-subject adjoining [spec, FocP]. To the best of my knowledge, the syntax of wh-questions in Hail Arabic has never been investigated. The goal of this paper is to bridge that gap by providing a syntactic explanation of the wh-subject question in HA.

## 3. Theoretical background

### 3.1. Minimalist Program (MP)

This study is based on the Minimalist Program (MP) (Chomsky 1995). The syntactic theories have gone through several changes during the last five decades. The Minimalist Program is one of the syntactic frameworks that were developed by Chomsky (1995, 2001, 2004, 2008, 2013, 2015). Chomsky started the MP by defining the faculty of language (FL). He stated that the Faculty of Language has two interfaces: (a) the Conceptual-Intentional system (C-I or LF) and (b) the Sensorimotor system (SM or PF), with the syntax governing the relation between the two interfaces. A basic representation of the PF and LF interfaces of the model of grammar is schematically shown in (1) below:

1.



(Radford, 2009, p. 14)

MP has three basic syntactic operations: **Merge, Move, and Agree**.

**Merge:** It has two types: (i) External Merge and (ii) Internal Merge. An external merge involves combining two lexical items from the lexicon. An internal merge, also known as a **Move**, involves re-emerging an already merged category (i.e. in its base-position in a syntactic structure) and positions it higher in the hierarchy.

MP is based on the bottom-up derivational structure. According to Chomsky (1995, p. 225), the derivational structure starts by Select the lexical items objects from the (Numeration (N)). Then, the syntactic objects are combined by the syntactic operation Merge.

**Move:** It is defined as an instance internal that involves the re-merge of an already merged items with another two items.

**Agree:** In the early 2000s, the focus shifted from feature-checking as a requirement for movement to feature-checking as a requirement for agreement. The terms imposed on the operation Agree are outlined below (Chomsky, 2000, p. 122):

i.  $\alpha$  carries at least one uninterpretable/unvalued feature

$\beta$  has a matching interpretable/valued feature.

ii.  $\alpha$  c-commands  $\beta$ .

e. There is no potential goal  $\gamma$  intervening between  $\alpha$  and  $\beta$ . (Chomsky, 2000, p.122).

In MP, there are two types of features: (a) the interpretable features and (b) the uninterpretable features. The interpretable features [iF] have a semantic content while the uninterpretable features [uF] do not have a semantic content. The uninterpretable features are probes that search for interpretable features/Goals to value/check their [uF] before they are deleted. This operation (i.e., Probe-Goal configuration) is called Agree/feature checking theory in MP (Chomsky, 1995).

### 3.2. Split CP-system (Rizzi 1997)

Numerous works have addressed the inner structure of the CP-domain in natural languages since Rizzi's seminal work (1997) on the fine structure of the left periphery. The CP layer, according to Rizzi (1997), is divided into various projections. These projections are said to be fixed because they are based on a number of universal prerequisites, but various studies have found variations and suggested changes (e.g., Rizzi 2004; Haegeman 2003, among others). The five layers that make up the CP are as follows: Force Phrase, which is the highest projection that indicates the sentence's illocutionary force. There is a Topic Phrase below this that hosts dislocated topics. TopP is followed by Focus Phrase, which contains focused elements such as interrogatives. Below the focus phrase, there is another TopP, which is followed by the Finiteness Phrase, which encodes the sentence's finiteness or non-finiteness. FinP is, in turn, the lowest projection in this hierarchy. Consider the following tree diagram:

2.



(Rizzi,1997, p.297).

## 4. Overview of Hail Arabic

Aramaic, Ethiopian, South Arabian, Syriac, and Hebrew are all Semitic languages that belong to the Afro-Asiatic (Hamito-Semitic) family. The Middle East, the Arabian Peninsula, and Africa are home to many of these languages. Within a few decades after the Islamic conquests of the Arabian Peninsula, Arabic spread across North Africa and the Middle East. Arabic is now spoken by more than 200 million speakers excluding bilingual speakers (Aoun et al, 2010; Watson, 2007). In Saudi Arabia, there are four dialects: Najdi (in the center of Saudi Arabia), Hijazi (in the west), Assiri (in the south), and Sharqawi (in the east). (Al Amro, 2019).

The Hail Arabic dialect is a subpart of the Najdi Arabic dialect. The Hail region (highlighted in red on the map below) is located northwestern Saudi Arabia. Hail city has more than 600.000 speakers according to the latest census (2018).





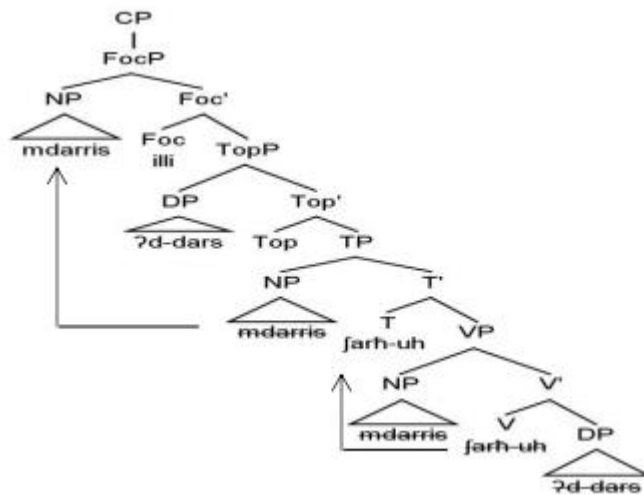
teacher            that    explain.3SGM.PAST            the-lesson  
 ‘It was a teacher that explained the lesson.’

Second, the assumption that *illi* heads the FocP does not account for the ungrammaticality that results in topicalizing the DP object as in (8) below (the topicalized object and its co-referential clitic are italicised):

8. \*mdarris            illi    ?d-dars            farh-uh  
 teacher            that    the-lesson            explain.3SGM.PAST-it  
 ‘It was a teacher that explained the lesson.’

If *illi* heads the FocP, nothing bans the DP object *?d-dars* ‘the lesson’ to move to the specifier position of the lower TopP as sketched in (9):

9.

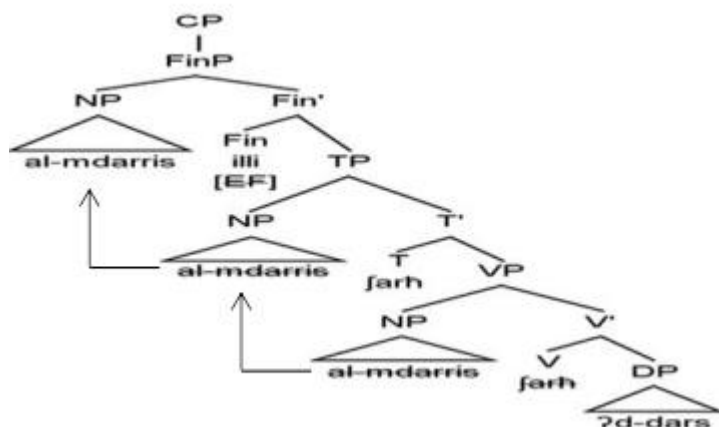


In order to accommodate problems that encounter us in the two proposals mentioned above, I propose, following Rizzi (1997), that *illi* heads the FinP. Furthermore, I assume that *illi* has an edge feature [EF] that attracts the subject to the [spec, FinP]. Consider (5) which is, repeated here as (10), and its representation in (11):

10. al-mdarris            illi    farh    ?d-dars  
 The-teacher            that    explain.3SGM.PAST                            the-lesson  
 ‘The teacher that explained the lesson.’

11.





The current proposal addresses two issues. First, the impossibility of focalizing elements preceding *illi* as the contrast in (12a) and (12b), demonstrates:

12. a. \***mdarris**      illi      farh      ?d-dars  
          teacher      that      explain.3SGM.PAST      the-lesson  
 ‘It was a teacher that explained the lesson.’
- b. mdarris      illi      farh      ?d-dars  
          teacher      that      explain.3SGM.PAST      the-lesson  
 ‘It was a teacher that explained the lesson.’

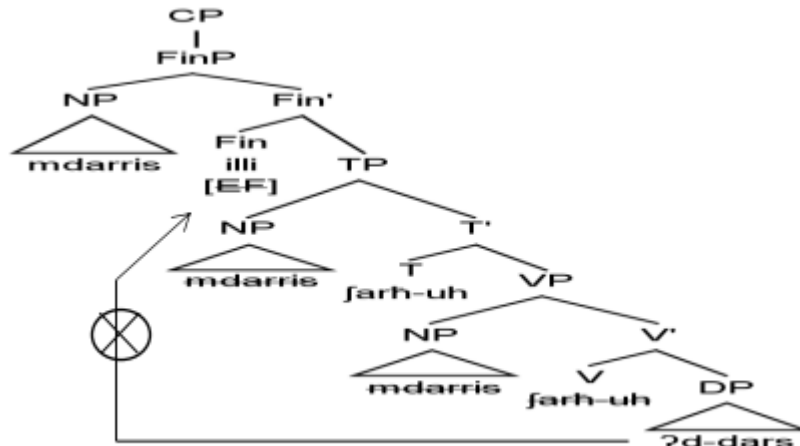
My proposal suggests that the main motivation for the movement of the subject to the left of *illi* is to satisfy the edge feature [EF] on the head  $Fin^{\circ}$ . In other words, the movement of the subject is not driven by focalization nor topicalisation, thus, sentence (12a) is ruled out.

Second, the current proposal accounts for the impossibility of fronting the DP object to the left periphery (i.e. between *illi* and the TP) as (13), shows:

13. \*mdarris      illi      ?d-dars      farh-uh  
          teacher      that      the-lesson      explain.3SGM.PAST-it  
 ‘It was a teacher that explained the lesson.’

Recall that the current proposal locates *illi* in the lowest head of CP, namely the  $Fin^{\circ}$  head. With this being so, the fronted object is disallowed to appear between TP and FinP as there is no available projection that can host it as the representation in (14) illustrates:

14.



It is worth pointing out that the complementizer *illi* doesn't allow adjuncts (prepositional phrases/adverbials/) to appear to its left as respectively shown in (15a) and (15b):

15. a. \*bi-l-fas<sup>ɕ</sup>l      illi      al-mdarris      farh      ?d-dars  
          In-the-class      that      the-teacher      explain.3SGM.PAST      the-lesson  
          'It was in the class that the teacher explained the lesson.'
- b. \*bsrɕah illi      al-mdarris      farh      ?d-dars  
          quickly that      the-teacher      explain.3SGM.PAST      the-lesson  
          'It was quickly that the teacher explained the lesson.'

To account for the ungrammaticality in (15a) and (15b) above, one might postulate that the complementizer *illi* 'that' is endowed with a [+nominal] feature that only attracts nominal elements adjoining [spec, FinP]. Given this, the appearance of adjuncts to the left of *illi* yields illicit sentences.

So far, I have discussed two positions that the subject in HA occupies, namely [spec, TP] and [spec, FinP]. There is, however, a third position that the subject lands in. It can appear in the left periphery, more specifically, to the left of a pronoun. Interestingly, in the third position, the subject must be stressed, otherwise the sentence becomes an ill-formed as the contrast in (16a) and (16b) shows (the focalized phrase appears in bold):

16. a. **al-mdarris**      hu      illi      farh      ?d-dars  
          The-teacher      he      that      explain.3SGM.PAST      the-lesson  
          'It was the teacher who explained the lesson.'
- b. \*al-mdarris      hu      illi      farh      ?d-dars  
          The-teacher      he      that      explain.3SGM.PAST      the-lesson  
          'It was the teacher who explained the lesson.'

To determine the position of the subject, I will first discuss the function and position of the pronoun. I assume that the pronoun heads the focus phrase. In addition, I assume that the pronoun carries a cluster of features: [unvalued-phi features] and a strong contrastive focus feature [+F] and EPP feature. These features force the subject to move the specifier position of the FocP. I base my assumption on two observations. First, constituents preceding the pronoun must be contrastively stressed, otherwise the sentence becomes ungrammatical as the contrast in (17a-b) shows:

17. a. **al-mdarris**      hu      illi      farh      ?d-dars      muhu  
          the-teacher      he      that      explain.3SGM.PAST      the-lesson      not

ʔt̪<sup>ʕ</sup>- t̪<sup>ʕ</sup>a:lib

the-student

‘It was the teacher (not the student) who explained the lesson.’

b.*al-mdarris	hu	illi	ʃarħ	ʔd-dars	muħu
the-teacher	he	that	explain.3SGM.PAST	the-lesson	not

ʔt̪<sup>ʕ</sup>- t̪<sup>ʕ</sup>a:lib

the-student

‘It was the teacher (not the student) who explained the lesson.’

The second observation is that when the pronoun (the focus head) is present, the subject must move to the left periphery (to the spec, FocP) as (18a) shows. If the subject remains in-situ (i.e. in spec, TP), this yields an illicit sentence as shown in (18b):

18. a. <b>al-mdarris</b>	hu	illi	ʃarħ	ʔd-dars	muħu
the-teacher	he	that	explain.3SGM.PAST	the-lesson	not

ʔt̪<sup>ʕ</sup>- t̪<sup>ʕ</sup>a:lib

the-student

‘It was the teacher (not the student) who explained the lesson.’

b.*hu	illi	<b>al-mdarris</b>	ʃarħ	ʔd-dars	muħu
he	that	the-teacher	explain.3SGM.PAST	the-lesson	not

ʔt̪<sup>ʕ</sup>- t̪<sup>ʕ</sup>a:lib

the-student

‘It was the teacher (not the student) who explained the lesson.’

It is worth pointing out that the phi features spelled out on the focus head (the pronoun) should match the phi features cliticized to the verb inside the TP as (19) shows (the pronoun and the phi features on the verb are boldfaced):

19. al-mdarsi:n	<b>ħΛm</b>	illi	ʃarħ- <b>u</b>	ʔd-dars
The-teachers	they	that	explain-3PLM	the-lesson

‘It was the teachers who explained the lesson.’

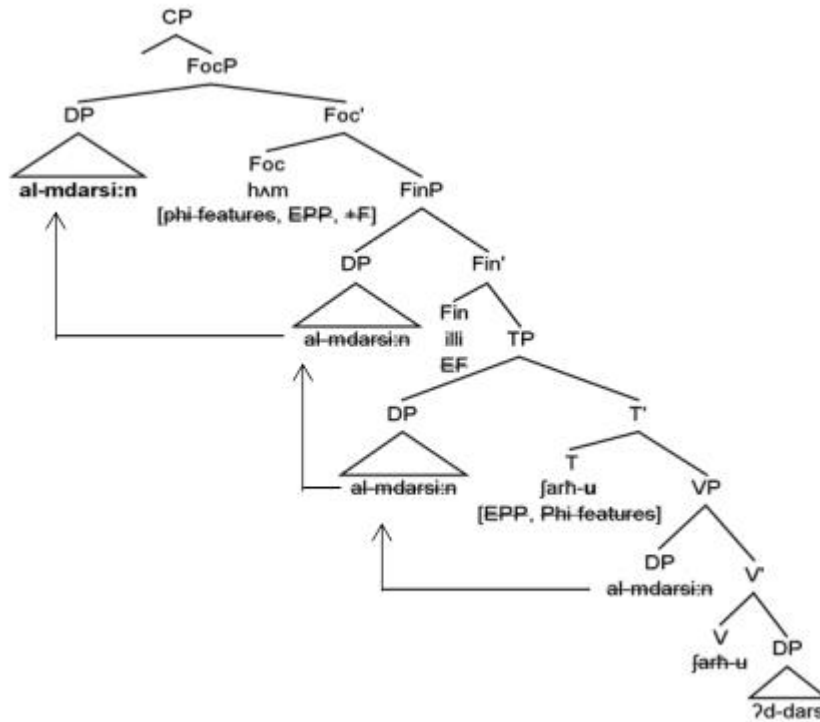
On the other hand, phi features mismatch yields an ungrammatical sentence as in (20):

20.*al-mdarsi:n	<b>ħΛm</b>	illi	ʃarħ- <b>an</b>	ʔd-dars
The-teachers	they	that	explain-3PLF	the-lesson

‘It was the teachers who explained the lesson.’

The contrast in (19) and (20) suggests that the focus head bears unvalued phi features that are valued by the subject. It also shows that the subject *al-mdarsi:n* ‘the teachers’ moves three times. First, it moves from [spec, VP] to [spec, TP] to check the phi features on T°. Second, it moves to [spec, FinP] to satisfy the edge feature on Fin° head. Then, it moves to [spec, FocP] to value the phi features and the contrastive focus feature on the head Foc°. The phi features that are valued by the subject *al-mdarsi:n* ‘the teachers’ are spelled out as a strong pronoun in the focus head and as a suffix (clitic) attached to the verb as in (19) which is sketched in (21):

21.



Based on the above discussion, we conclude that the subject in HA occurs in three positions: [spec, TP], [spec, FinP], and [spec, FocP]. I show the complementizer *illi* ‘that’ heads the FinP that bears an edge feature [EF] which triggers movement of the subject to the spec position of FinP. Finally, the subject shows up before a pronoun which is assumed to head the focus phrase. The subject moves to [spec, FocP] to value the unvalued phi features and the contrastive focus feature on the focus head. The three positions are summarized in (22a), (22b), and (22c) respectively:

22. a. al-mdarris                      farh                                      ?d-dars  
       The-teacher                      explain.3SGM                                      the-lesson  
       ‘The teacher explained the lesson.’
- b. al-mdarris      illi                      farh                                      ?d-dars  
       The-teacher      that                      explain.3SGM                                      the-lesson  
       ‘The teacher that explained the lesson.’
- c. **al-mdarris**      hu      illi                      farh                                      ?d-dars  
       The-teacher      he      that                      explain.3SGM                                      the-lesson  
       ‘It was teacher who explained the lesson.’

## 5.2. Formation of the Wh-subject in HA

In this section, I will go over the formation of wh-subjects in HA. I will also demonstrate how the wh-subject is derived. To begin, the wh-subject question is constructed by replacing the subject with the wh-word *min* ‘who’. Consider the following declarative sentences (22a-c), which are repeated below as (23a-c), and their interrogative counterparts (24a-c):

- 23.a. al-mdarris                      farh                                      ?d-dars  
       The-teacher                      explain.3SGM                                      the-lesson  
       ‘The teacher explained the lesson.’

- b. al-mdarris illi farh ?d-dars  
 The-teacher that explain.3SGM the-lesson  
 ‘The teacher that explained the lesson.’
- c. **al-mdarris** hu illi farh ?d-dars  
 The-teacher he that explain.3SGM the-lesson  
 ‘It was a teacher who explained the lesson.’
- 24.a. min farh ?d-dars  
 Who explain.3SGM the-lesson  
 ‘Who explained the lesson?’
- b. min illi farh ?d-dars  
 who that explain.3SGM the-lesson  
 ‘Who explained the lesson?’
- c. **min** hu illi farh ?d-dars  
 who he that explain.3SGM the-lesson  
 ‘Who explained the lesson?’

It is worth pointing out that the subject wh-phrase *min* ‘who’ may also occur clause finally as (25) shows:

25. illi farh ?d-dars min hu  
 that explain.3SGM the-lesson who he  
 ‘Who explained the lesson?’

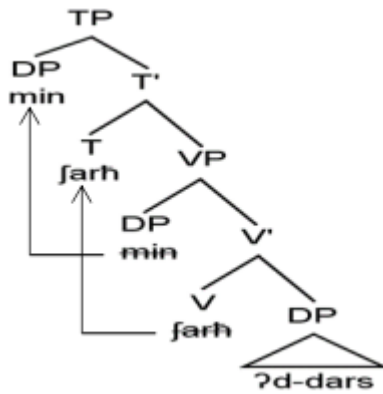
So far, I have shown that the Wh-word *min* ‘who’ appears clause initially, as shown in (24a-c). Also, the subject wh-phrase *min* ‘who’ appears in a clause-final position as in (25). In the following section, I will explain how interrogative sentences (24a-c) and (25) are derived and how interrogation is licensed.

### 5.3. Derivation of the Wh-subject in HA

This section will reveal how the wh-subject is derived. I will also illustrate how interrogation is licensed. I will explain the derivation using three examples in which the wh-subject word *min* ‘who’ occurs in three different positions. Let’s take the derivation of sentence (24a), which is repeated below as (26), and its representation as shown in (27):<sup>5</sup>

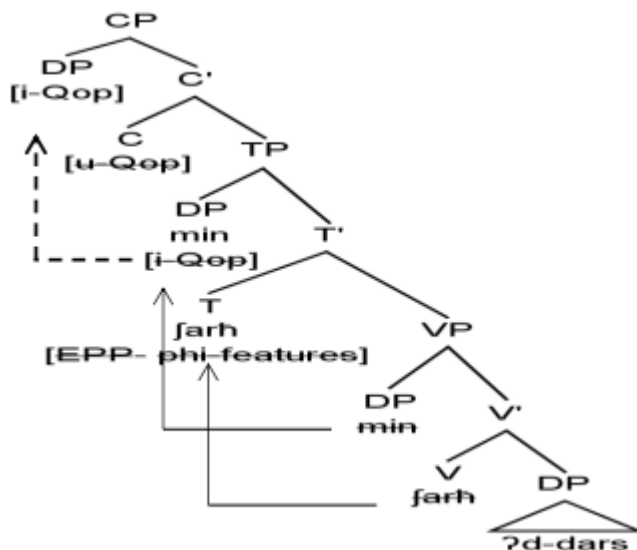
26. min farh ?d-dars  
 Who explain.3SGM the-lesson  
 ‘Who explained the lesson?’
- 27.

<sup>5</sup> The tree diagram in (27) is preliminary. Its modified version is shown in (28).



The derivation will proceed as follows. The verb *farh* ‘explain’ is merged with the DP object *?d-dars* ‘the lesson’ to form the VP *farh ?d-dars* ‘explained the lesson’. The wh-subject *min* ‘who’ merges to the spec of the head V. This then merges with a past tense constituent. Thus, the verb *farh* ‘explain’ raises to T to check the [tense] feature, while the wh-subject moves to the tense to check the EPP feature, and the phi features on the T head. Here, the question that arises at this point is: what clause-types sentence (25) as interrogative while the wh-subject remains in situ [spec, TP]? Following Gad (2011), I propose that clause in (26) is licensed via LF movement of an operator [Op] which carries a strong [wh] feature. The Op moves at LF to the Spec CP position to value the unvalued [u-wh] feature on C. The tree diagram in (27) is modified as in (28):<sup>6</sup>

28.



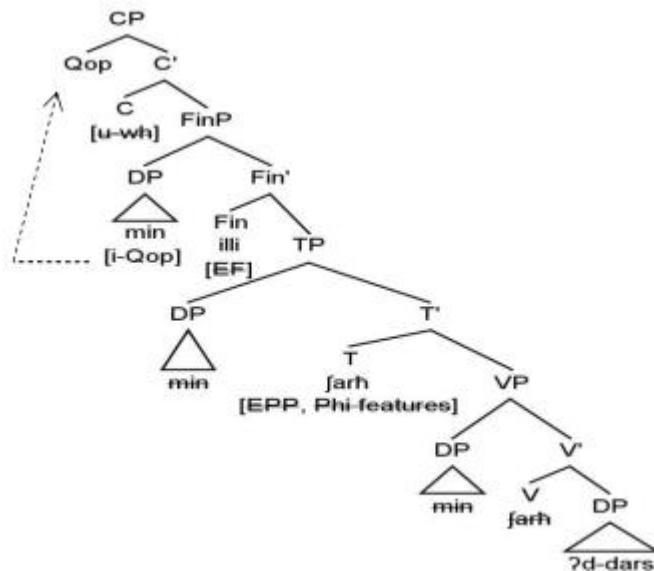
Having discussed the derivation of sentence (26), I shall now show the derivation of (24b), repeated below as (29):

29. min	illi	farh	?d-dars
who	that	explain.3SGM	the-lesson
‘Who explained the lesson?’			

<sup>6</sup> The dotted line indicates the covert movement of the operator that licenses interrogation in sentence (26).

The derivation discussed under (26) is extended to (29) up to the point where the subject wh-phrase in (29) moves from [spec, TP] to [spec, FinP] headed by *illi* to satisfy an edge feature [EF] on Fin<sup>o</sup>. Again, the same question asked under (26) is repeated here: how sentence (29) is licensed interrogative while the wh-question phrase is in [spec, FinP]. I also claim that it is licensed via LF movement of an operator [Op], which carries a strong [wh] feature. In spec-head relation, the operator values the unvalued [u-wh] on C head. The derivation of (29) is sketched in (30):

30.

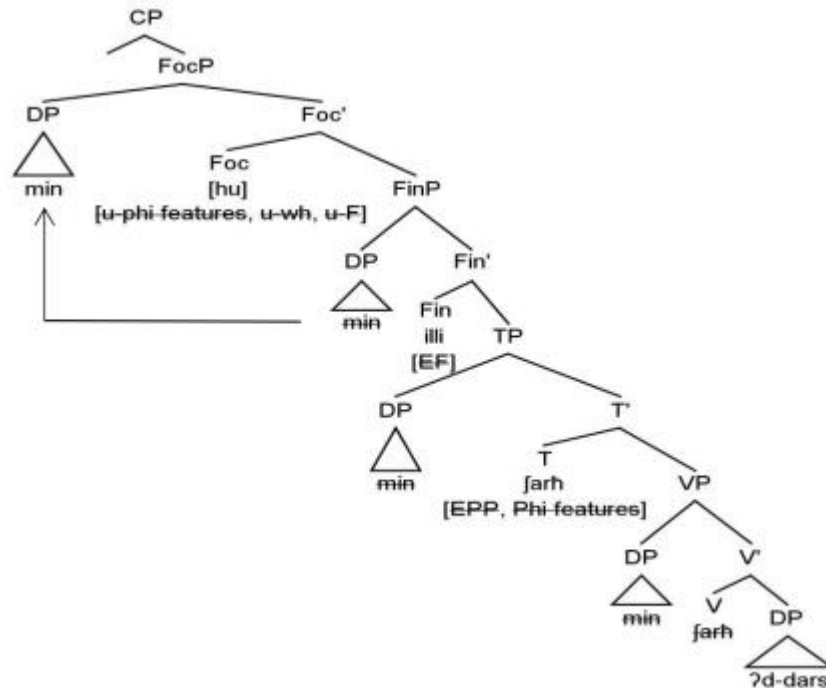


The derivation of the third position is demonstrated under (31):

- |         |    |      |              |            |
|---------|----|------|--------------|------------|
| 31. min | hu | illi | jarh         | ?d-dars    |
| who     | he | that | explain.3SGM | the-lesson |
- ‘Who explained the lesson?’

There are two important steps in the derivation of sentence (31). First, the subject wh-phrase *min* ‘who’ raises to the spec position of FinP to satisfy the edge feature on Fin<sup>o</sup>. Next, it moves to [spec, FocP] to value a set of unvalued features on Foc head: unvalued phi features, a strong contrastive feature [+F], and the unvalued [u-Wh] feature. Unlike the first two cases in which interrogation licensed covertly, in (31), the wh-phrase *min* ‘who’ moves overtly in order to license sentence (31) as interrogative. The following tree diagram illustrates the derivation of (31):

32.

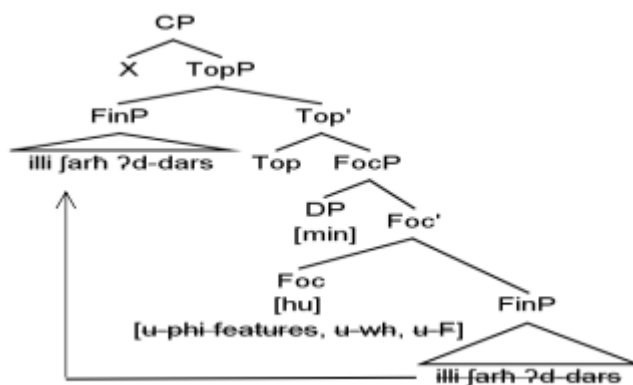


The discussion above revolves around cases where the wh-subject appears clause initially. However, there are cases in which the wh-phrase can appear in a clause final position as in (25), repeated below as (33), for ease of exposition:

33. illi                      farh                      ?d-dars              min              hu  
 that                      explain.3SGM              the-lesson              who              he  
 ‘Who explained the lesson?’

To account for this phenomenon, I propose, following (Gad 2011), that *illi*-clause raises to the specifier position of the upper topic phrase [spec, TopP], while the wh-phrase remains in [spec, FocP], thus satisfying freezing constraint.<sup>7</sup> The derivation of a wh-phrase preceded by *illi* clause is illustrated in the representation in (34):

34.



<sup>7</sup> Freezing Constraint states that ‘a phrase meeting a criterion is frozen in place’ (Rizzi 2006, p.112).



## 6. Conclusions

In this paper, I have explored the wh-subject syntax in Hail Arabic. I have shown that the wh-subject item *min* ‘who’ can occur in three positions, namely [spec,TP], [spec, FinP], and [Spec, FocP]. Following Rizzi (1997), I assumed that the complementiser *illi* ‘that’ heads the FinP. I also claimed that *illi* has an EPP feature that forces the wh-subject to adjoin the specifier position of the FinP. In the first two positions [spec,TP], and [Spec, FinP], there was a question that arose: How is interrogation licensed while the wh-subject in [spec, TP], or FinP? I tackled this issue, following Gad (2011), by proposing that wh-phrases are licensed via LF movement of an operator [Op] which carries a strong [wh] feature. The operator moves covertly to [spec, CP] to value the [Wh] feature on C<sup>o</sup>, thus licensing the sentence as interrogative. Furthermore, I assumed that pronouns such as *hu* ‘he’ in HA head the FocP. I suggested that the wh-subject raises to [spec, FocP] to satisfy a set of features (phi features, wh feature, focus feature) on the head Foc<sup>o</sup>. I also accounted for cases in which the wh-subject appears in the final clause position preceded by *illi*-clause. I proposed that the *illi*-clause raises to the specifier position of the upper topic phrase [spec, TopP], while the wh-clause remains in [spec, FocP].

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## **Academic Performance And Beliefs About Mathematics In College Students**

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### **Abstract**

The objective of this research is to consider the possible relationship between academic performance and university students' beliefs about Mathematics, particularly in the subject of Integral Calculus. The methodology employed is quantitative, descriptive and correlational, based on a non-experimental design. The instrument used for the collection of information was based on a structured questionnaire of questions with Likert scale type answers, whose validity and reliability were studied, applied to 30 Mechanical Engineering students of the Universidad Francisco de Paula Santander, Cúcuta,

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Norte de Santander, Colombia, selected by non-probabilistic sampling. For academic performance, the grades of the first pre-test (corresponding to 23.33 % of the final grade of the subject) of Integral Calculus were used. The results strengthen the conclusion that beliefs about Mathematics, from the students' perspective, are related to their academic performance in this area.

**Keywords** mathematics education, beliefs, college students, academic performance.

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## **Introduction**

The teaching-learning process of mathematics generates many difficulties in students, especially in higher education, of different nature. Some of them have their origin in factors such as low academic performance, high absenteeism rates, etc. High dropout rates, mainly in higher education, have been identified as consequences of these difficulties encountered by students and have become concerns of governmental educational institutions, as well as teachers at all educational levels (Chong, 2017). Within this wide range of options, a great interest arises in the study of the affective domain of Mathematics considering it is composed of beliefs, attitudes and emotions about the teaching/learning of this subject (Fernandez et al., 2018). It is presumed that many students do not like Mathematics. In addition, they are usually seen by university students as a subject with no use in life, difficult, boring, in general, impractical, asserting that its teaching-learning requires additional time for its dedication and that it is not affordable for everyone (Castillo-Sánchez et al., 2020). Undoubtedly, many aspects influence this fear, for example, the attitude of mathematics teachers towards students, the teaching styles and the attitudes and beliefs towards mathematics that are transmitted to them. These beliefs, both of teachers and students, very possibly influence inadequate learning of mathematics and even grade repetition and dropout (Cosgaya-Barrera & Castro-Villagrán, 2019).

A change in the perception of the teaching-learning of mathematics by university students and teachers, especially in higher education, is necessary. In general, in Colombia, depending on the university and academic program, Mathematics teachers are mostly teachers of other specialties different from Mathematics Education graduates, which suggests that their liking for Mathematics is debatable.

In the Colombian context, the Ministry of National Education (Mineducación), through processes such as those required for qualified registrations and high-quality accreditation, emanates quality criteria and referents for the different areas and components that make up a university educational community, thereby promoting the strengthening of academic programs and the improvement of teaching/learning (Decree 1330, 2019).

One way to evaluate the teaching/learning processes and programs is the academic performance of students (Tourón, 1984), defining university academic performance as a result of learning, elicited by the educational activity of the teacher and produced in the student and which is expressed in a grade, quantitative or qualitative in many cases, or a grade, which is consistent and valid will be the reflection of certain learning or level in which pre-established objectives have been achieved. Grades are the reflection of the evaluations and/or exams where the student has to demonstrate his or her knowledge of the different areas or subjects (Cascón, 2000). In most cases, to evaluate the student's academic performance, the teacher relies on the grades or marks taken in the different subjects studied by the student. It could be said that academic performance would be evidence of the ability and effort that the student displays in the classroom, without underestimating his or her attitude and aptitude.

However, academic performance is not the only way to measure the success of the teaching/learning process, since other factors influence it, such as, for example, the breadth of the curricula, the teaching methodologies used, the possibility of employing personalized teaching, the previous concepts that students have, as well as the level of formal thinking that students develop (Benítez et al., 2000).

It seems clear that the most recurrent indicator of academic performance is the grade (Hernández, 2016), and they are considered the reference of academic results since grades constitute in themselves the social and legal criterion of the student's academic performance. Likewise, the grade has an informative purpose for parents and academic authorities in educational systems.

In summary, it can be said that academic performance is an indicator of the level of learning achieved by the student. It is the effect of the different actions that take place in the educational environment

in many cases, interpreted as success or failure in the study. So, the university education system attaches great importance to this indicator.

In addition, students with higher mathematical self-concept and higher expectations obtain better grades attributing more dedication to effort than students with lower or low mathematical self-concept (Sampascual et al., 1994). In conclusion, students with higher self-concept beliefs about doing well in mathematics with higher intrinsic motivation obtain better results in learning mathematics, regardless of whether the students have learning problems or not (Pintrich et al., 1994).

Therefore, the present research was developed to determine to what extent there is a relationship between the affective domain towards mathematics in these university students and academic performance in the subject of Integral Calculus.

### **Methodology**

The research approach is quantitative, with a non-experimental, cross-sectional correlational-causal design (Arias, 2012), which allows us to determine the relationships between beliefs about mathematics and academic performance.

### **Population and Sample**

The population consisted of 70 students enrolled in two groups in the year 2019 in the subject of integral calculus in the Mechanical Engineering program of the Universidad Francisco de Paula Santander de Cúcuta, Norte de Santander, Colombia. For the sample, the first group was taken, composed of 30 students of the male and female gender, aged between 17 and 25 years old, selected by non-probabilistic sampling.

The composition of the sample in terms of gender is shown in Table 1.

**Table 1** Student Gender

Gender	# of students	Percentage	Cumulative percentage
Female	3	10.0%	10.0%
Male	27	90.0%	100.0%
Total	30	100.0%	

The ages of the students in the sample are shown in Table 2.

**Table 2** Age of Students

Age in years completed	# of students	Percentage	Cumulative percentage
17	6	20.0%	20.0%
18	12	40.0%	60.0%
19	5	16.7%	76.7%
20	3	10.0%	86.7%
21	1	3.3%	90.0%
22	2	6.7%	96.7%
25	1	3.3%	100.0%
Total	30	100.0%	

**Instruments**

The technique used to obtain the affective domain data was the survey. The questionnaire was divided into 3 sections: The first on general information, the second on the affective domain, and the last section referring to mathematical processes in teaching practice. The reliability of the instrument was validated with the Cronbach's Alpha test, obtaining a result of .713 for the whole instrument. However, in this advance of the research, only the results referring to beliefs about mathematics and their possible relationship with academic achievement in mathematics are presented.

The variables established are:

**Beliefs about Mathematics**

It consists of a 13-question Likert scale-style questionnaire. Students responded to the questionnaire using one of the following alternatives: 1, meaning “I strongly disagree”, 2, “I disagree”, 3, “I neither disagree nor agree”, 4, “I agree”, 5, “I strongly agree”, according to their level of approval. Indicating their positive criterion in favor of increasing the item's value.



**Table 3** Items Associated With Beliefs About Mathematics

Second section. Affective Dominance Toward Mathematics					
Ítems asociados con las Creencias sobre las Matemáticas	1	2	3	4	5
Mathematics is useful and necessary in all aspects of life.					
Mathematics is difficult, boring and far from reality.					
In mathematics, it is essential to learn by heart the concepts, formulas and rules.					
Math exercises can be solved quickly if you know the formula, rule or procedure.					
To learn mathematics I must study on my own.					
When I solve a mathematical exercise, I care more about the result than the process used.					
The way I solve mathematical exercises in class is different from the way I solve everyday situations where mathematics is required.					
I look for different ways and forms to solve mathematical exercises.					
From what I do in class, I can invent my math exercises.					
Understanding mathematics helps me to solve doubts in other subjects.					
When I solve an exercise in mathematics, I feel confident in the correct answer.					
I consider myself very capable and skilled in mathematics.					
Mathematics is for intelligent and creative people					

### Academic Performance

In this variable, the grade obtained in the first pre-semester of the second academic semester of 2019 was considered, ranging from 0.0 to 5.0. The valuation of the grades achieved is as follows: from 0.0 to 2.9 low performance and failure, from 3.0 to 3.9 basic performance, from 4.0 to 4.5 high performance and 4.6 to 5.0 superior performance, with

a grade of 3.0 or higher are approved, according to article 118 of agreement 065 of 1996, “student statute of the UFPS”. The test that constituted the first pre-test can be seen in Figure 1.

**Figure 1** Items Associated with Academic Performance

PRIMER PREVIO DE CALCULO INTEGRAL  
(Semestre II de 2019)

En este previo se evaluarán los temas vistos en clase, los cuales tienen que ver con el desarrollo de integrales utilizando las formulas básicas de integración las que pueden disponer de ellas, tiempo para el desarrollo del previo: 2 horas.  
Desarrollar la siguientes integrales y comprobar las dos primeras por medio de su derivación (valor cada punto 1.25).

1. $\int (\sqrt{x} - \frac{1}{2}x + 2/\sqrt{x}) dx$	2. $\int \frac{(e^{4x} - e^{2x} + 1)dx}{e^x}$
3. $\int \frac{x dx}{\sqrt{27+6x-x^2}}$	4. $\int \tan x \ln(\cos x) dx$

### Data processing and analysis

The Excel spreadsheet was used for the presentation of the results and SPSS version 22 software was used for the statistical hypothesis contrasts and calculation of correlations. To determine the degree of association (correlation coefficient) between the study variables. Spearman's Rho was used to determine the dependence or independence of two random variables (Pérez-Tejada, 1998). Spearman's Rho correlation coefficient is used when the variables are ordinal and/or the normality assumption is not met (non-parametric approximation). This coefficient is very useful when the number of pairs of subjects (n) to be associated is small (less than 30). It is a dimensionless value ranging from -1 to +1. From the values it takes, the relationship between the variables is deduced, with the value zero meaning that there is no correlation between the variables analyzed; the value -1 is a high correlation of an indirect or inverse nature (when one grows the other decreases), and the value +1 a high correlation of a direct type (when one grows so does the other) (Aguayo, & Lora, 2007).

Hypothesis testing. A procedure that consists of contrasting a statement about a property of a population and using statistical tests to confirm or refute it. For this research advance, the following hypotheses were raised in contrast to hypotheses:

H1: There is a relationship between beliefs about mathematics and students' academic performance.

H0: There is no relationship between beliefs about mathematics and students' academic performance.

### Results

The beliefs about the mathematics of the students in the sample studied are shown in Table 4.

**Table 4** Students' Perceptions of Beliefs About Mathematics

Level of beliefs about mathematics	# of students	Percentage	Cumulative percentage
Strongly disagree	0	0.0%	0.0%
Disagree	3	10.0%	10.0%
Neither rejects nor accepts	16	53.3%	63.3%
Agree	10	33.3%	96.7%
Totally agree	1	3.3%	100.0%
Total	30	100.0%	

The grade of the first pre-requisite, a quantitative measure of academic performance, is shown in Table 5.

**Table 5** Student Academic Performance

Note	# of students	Percentage	Cumulative percentage
1.7	2	6.7%	6.7%
2.0	1	3.3%	10.0%
2.5	4	13.3%	23.3%
2.8	1	3.3%	26.7%
3.0	10	33.3%	60.0%
3.5	1	3.3%	63.3%
4.0	8	26.7%	90.0%
4.1	2	6.7%	96.7%
4.5	1	3.3%	100.0%
Total	30	100.0%	

Table 6 shows Spearman's Rho correlation between the variable's beliefs about mathematics and academic performance.

**Table 6** Relationship Between Academic Achievement Level and Students' Beliefs About Mathematics

Correlations		Academic performance	Beliefs about mathematics
Spearman's Rho	Academic Performance	Correlation coefficient	1.000
		Sig. (bilateral)	0.000
		N	30
	Beliefs about mathematics	Correlation coefficient	-----
		Sig. (bilateral)	-----
		N	-----

Regarding the composition of the sample by gender and age, it is worth noting that it is evident that 90% of the Mechanical Engineering students who make up the sample are male, which is in line with other studies, such as that of Chávez (2018) in his study “Learning strategies and academic performance in the subject Mathematical Analysis II”. On the other hand, the mean age of the Mechanical Engineering students who made up the sample is 18.77 years, with a range of 8 years, comprised between 17 and 25 and a standard deviation of 1.81 years. The sample shows that 40% of them are 18 years old and the most repeated age (mode) is 18 years old.

Regarding beliefs, it was found that 53.3% of the students surveyed have neither a positive nor a negative belief towards mathematics, followed by 33.3% who agree with the items raised. In the present research, 36.9% of the respondents think that they have a positive tendency to agree with the beliefs about mathematics agreeing with Mato et al. (2014).

About the academic performance of the students, they presented grades ranging from 1.7 to 4.5, with a range of grades of 2.8, a mean of 3.213 and a standard deviation of .7651. It is also shown that 33.3% of the students scored a grade of 3.0 and were able to pass the

pre-test, and it also stands out that 26.7% of the students scored a grade of 4.0. The great majority, 73.3%, of the students obtained grades that indicate that they passed the pre-test. Among them, 36.7% are in high levels or higher. This high performance could be due to the influence of pedagogical practices and the teacher's mastery of mathematics content (Caciá et al., 2012). This enhances a better understanding and learning of mathematics topics by students, as stated by López-Quijano (2014).

As a relationship between performance and beliefs, Spearman's Rho correlation between the variable's beliefs about mathematics and academic performance is shown. A positive correlation is observed, that is, as the positive perception of beliefs about mathematics increases, students' academic performance increases, and vice versa. The correlation has a value of  $r = .796$  and a statistically significant  $p$ -value of  $p < .000$ . Therefore, it can be stated that the null hypothesis ( $H_0$ ) is rejected if the  $p = .000 < .01$ , resulting in sufficient statistical evidence to accept that there is a relationship between the Beliefs about Mathematics and academic performance in the students of Integral Calculus of Mechanical Engineering of the year 2019 of the Universidad Francisco de Paula Santander of the Municipality of Cúcuta, Norte de Santander-Colombia.

The correlation between beliefs about mathematics and academic achievement, which were the variables studied, is strong ( $r = .796$ ), presenting certain concordances with the results obtained by Pintrich et al. (1994) and by Sampascual et al. (1994), which show that the achievement of success is related to internal or intrapersonal controllable causes such as effort, ability, and dedication with motivational and cognitive aspects. The results of these studies have confirmed that those students who attributed success to internal causes and control were less anxious, had higher expectations of success, were more mastery-oriented, self-sufficient, effective and metacognitive, and performed better. Additionally, students who believed that their failure was due to unstable and uncontrollable factors were less mastery-oriented, less effective, and had lower achievement expectations and lower academic performance.

In this advance, the research hypothesis is confirmed because there is a significant relationship between beliefs in Mathematics and the academic performance of the students of Integral Calculus of

Mechanical Engineering of the educational institution under study having obtained results similar to Mato et al. (2014) and Bazán and Aparicio (2006), who observed positive and significant values in all cases so that grades increase as a function of attitudes influenced by positive beliefs towards mathematics.

## **Conclusions**

This paper has shown an advance of research that sought to establish the relationship between beliefs about Mathematics and its possible link with academic performance in university students, specifically in this case students of Integral Calculus of the Mechanical Engineering academic program. It is concluded, in light of the results, the existence of a relationship between the student's beliefs about Mathematics and their academic performance, indicating that the higher the positive increase or the better the perception of beliefs about mathematics, the better the academic performance and vice versa, the lower the perception, the lower the academic performance.

As it corresponds to a pilot study, the purpose of this study has not been to generalize this relationship but to have an approximation (partial results) to determine the relationship between these variables in a subsequent study that includes a larger number of students not only from all academic programs and semesters where Mathematics subjects are seen but also from different educational institutions at the primary level, secondary technical and university level in the Department of Norte de Santander - Colombia, to establish a triangulation between the background and the theoretical positions that support it, to account for the logics that explain their perceptions about beliefs, attitudes and emotions as constructs of the affective domain and the pedagogical practice in the mathematical processes of teachers, in terms of academic performance and the light of each of the hypotheses raised.

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