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Research Article

Implementation of Basic Technical Drawing in Favor of the Cognitive, Procedural and Attitudinal Development of High School Students 2023 – 2024

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Summary

In the present study, the authors who are research teachers from the University of Guayaquil, Argos Technological University, as well as research teachers from the Liceo Naval Educational Unit of Guayaquil and the Vicente Piedrahita Educational Unit, propose the Implementation of Basic Technical Drawing to the students. of the Guayaquil Naval Lyceum Educational Unit, since there are several factors that limited the development and quality of motor activities/tasks with greater precision (fine), such as the radical change from the physical classroom to the virtual one in times of Covid-19. 19, likewise the difficulties in the various academic activities that require the supervision and control of the teacher such as writing, drawings and the demonstration/correction of the activities/tasks, this includes young people who are in the different universities. In addition, another of the consequences is the extended time of the use of digital technologies that continue to generate health problems, lack of interest and impatience to carry out daily oculo-manual activities in children and young people, in the same way at a biopsychosocial level such as the use inappropriate technologies. For this reason, this study aims to enhance the cognitive, procedural and attitudinal development of students through activities that express projects, inventions, ideas in a precise, clear and legible way of materials, objects, dimensions of a space, treatments, among others, as a response to a logical reasoning for the construction of a design or maintenance of some construction, since the application of Technical Drawing in the educational system optimizes the students' perception of the context and its representation far beyond what is normal, It benefits observation and develops many areas of brain functions, improving learning and intelligence.

Keywords: Implementation; Drawing; Cognitive; Attitudinal

Introduction

The accelerated increase of digital technologies in world society continues to generate a great impact on the work of the human being, where significant advances have been evidenced such as in the area of health: medical resources and instruments, artificial intelligence, algorithms, transplants, brain chips. Similarly, in the educational field, digital technologies contribute to the development of learning using operating systems, applications that favor creativity, optimize and simplify educational tasks, the internet that helps with quick access to information, virtual classrooms that favor online education, among others [1].

Therefore, due to the health emergency due to COVID-19, online education takes on great relevance in the world, despite the limited resources and ignorance of the management of Information and

Communication Technologies (ICT) in our environment, the educational process was maintained with great modifications in the contents of the National Curriculum through the Let's Learn Together at Home Plan. Through this national emergency plan, fiscal, tax and private institutions, according to their possibilities of academic offer, could offer online education in the synchronous "telematic" and asynchronous modality "virtual classroom and pre-recorded classes", which were intended to avoid manipulation with educational technologies for a long time [2,3].

However, there are several factors that limited the educational process from home, such as the lack of digital resources and connectivity in the population, as well as with the radical change of the physical classroom for the virtual one, which generated several difficulties in the various academic activities that require supervision and control of the teacher such as writing, drawings and the quality of activities/tasks. In addition, other consequences is the extended time of the use of digital technologies that continue to generate problems in children and young people, according to the American Academy of Pediatrics and experts point out that excessive time on the use of digital technologies, generate problems at the biopsychosocial level and among them are the inappropriate use of technologies (theft, theft, extortion, sexting, cyberbullying, etc.), can also affect privacy, security, deconcentration (distracting), limits social interaction, disturbs the perception in relation between the virtual and reality, increases physical inactivity, reduces the development of gross and fine motor skills [4-6].

In addition to this, in the progressive return to face-to-face classes, it was detected in the diagnostic evaluation of 2021 that most of the high school students of 3rd Baccalaureate and in 2022 in the students of 8th, 9th and 10th EGBS (in the period 2019-2020 they studied in EGB middle "school"), present slowness and disinterest more than normal to read and write in handwritten form, wrist pain, impatience to develop manual activities and in search of information (copy-paste), inattention, imprecision in fine motor skills: cutting, painting, drawing, strokes, manual activities and tasks developed inadequately, this problem is also pointed out by the [7].

For this, the implementation of basic technical drawing is proposed as a mechanism that helps students strengthen cognitive, procedural and attitudinal skills, since the application of Technical Drawing in the educational system optimizes in students the perception of the context and its representation far beyond normal, benefits observation and develops many areas of brain functions improving learning and intelligence. Therefore, nowadays it is very necessary to acquire visio-spatial skills because it is part of everyday life and infers cognitive transfer, it also helps visual memory, projection of reality, distribution and organization in spaces, transformation of objects, ordinary visual perception, contributes to fine motor skills and specifically writing [7,8].

What is technical drawing?

It consists of the representation or graphic language applied by architects, engineers or technicians to express projects, inventions, ideas in a precise, clear and legible way of materials, objects, dimensions of a space, treatments, among others, as a response to a logical reasoning for the construction of a design or maintenance of some construction [9,10].

What are the benefits of technical drawing?

For Pardos, J. In his Blog he states that Technical Drawing is fundamental in the educational system because it allows students to develop the perception of the context and representation far beyond normal, this being favorable to vision and that increases the brain functions of learning and intelligence. In today's society, it is very necessary to acquire visio-spatial skills in everyday life as a direct activity in cognitive transfer, it also helps visual memory, projection of reality, distribution and organization in spaces, transformation of objects, ordinary visual perception, contributes to fine motor skills and specifically writing [7,8].

Methodology

The Liceo Naval Educational Unit of Guayaquil follows the principles of the constructivist pedagogical models centres on Jean Piaget, since this model according to Saldarriaga, B. and Loor, M describes that learning is generated and built in the classroom and changes the traditional model, in addition to Freire, Leonard and McLaren they affirm that in the traditional model the teacher was the only person who transmitted the knowledge and that this process takes its name. of "banking education". Therefore, within this model of constructivism other pedagogical foundations are applied such as the zone of proximal development (ZDP) of Vigostky, because one of the main sources of knowledge is social interaction with other people, in the same way with the model of David Ausubel on the acquired knowledge that must be significant for life. Under this framework, and in conjunction with the philosophy of the campus, it is proposed to provide a quality and critical education accompanied by the different digital pedagogical models, the same ones that promote critical thinking, collaborative work, incorporation and application of the different theories to reality [11-15].

Methodological strategies

The methodological strategies that would be implemented to enhance the skills and abilities, the same ones that manage to empower creativity and acquire new knowledge to reach the metacognition of the students [16].

They are as follows

Strategies	Method	Technique
Explicit	Deductive	Exegetical or annotated reading
Implicit	Inductive	Games: Gamification
Significant	Analog (comparative)	Representation (drawing)
Cooperative	Logical	Self-instruction
Emotional	Symbolic or verbalistic	Case Study
Observational	Intuitive	Flipped Classroom
Experimental	Active	Directed discussion
By discovery	Participation - action	Dramatization
Memory	Globalized	Exhibitions
Receptive	Fragmented (by parts)	Concept or mind map
Latent	Specialized	Interpretation
Innovative	Dogmatic	Image analysis
Visual	Heuristic (discovery)	Comics
Auditory	Reciprocal	Theatre / Forum

Table 1: Methodological strategies.

Source: [16].

Development

For the implementation of technical drawing as an innovative practice in classrooms, several contents of some technical drawing books were investigated, classified, evaluated and discussed. certificates, where it was chosen to use the book "Technical Drawing I" by Estrada, J., *et al.* certified by the Autonomous University of Sinaloa, specifically units 1 and 2 that are consistent with the level of assimilation of students of Upper Basic and Baccalaureate. In this sense, the activities are related to the following Skills with Performance Criteria [9,17].

For its part, in the area of mathematics it is articulated with the curricular block 2 "Geometry and measurement", in the development of polygons, circles, solids, transformations and measures, in the same way in the general objective and skills with performance criteria of [18].

Performance-based skills	Performance-based skills
Basic General Education	**Unified General Baccalaureate**
ECA.4.1.15. Prepare and exhibit presentations related to contemporary works, creators and artistic manifestations (painting, music, architecture, sculpture, illustration, graphic novel, photography, installations, crafts, technology), in which the coherence and adequate organization of the information is attended.	Make artistic productions (a song, a drawing, a sculpture, a monologue, an installation, etc.) based on topics of personal or social interest (ECA.5.1.1.)
	Self-evaluate during the processes of artistic creation using technical criteria, recognizing one's own emotions (ECA.5.1.2.)

Table 2: Skills with RCT performance criteria that relate to technical drawing for 10th and 1st BGU.

Source: [17].

General objective of the area of mathematics
OG. M.2 Produce, communicate and generalize information, in a written, verbal, symbolic, graphic and/or technological way, through the application of mathematical knowledge and the organized, responsible and honest management of data sources, in order to understand other disciplines, understand the needs and potentialities of our country, and make decisions with social responsibility.

Table 3: General objective of mathematics that relates to Technical Drawing

Source: [18].

SKILLS WITH SUPERIOR BASIC PERFORMANCE CRITERIA
M.4.2.5. Define and identify similar geometric figures, according to the measurements of the angles and the relationship between the measurements of the sides, determining the scale factor between the figures (Thales' theorem).
M.4.2.6. Apply similarity in the construction of similar figures, the calculation of lengths and the solution of geometric problems.
M.4.2.7. Recognize and draw lines of symmetry in geometric figures to complete or solve them.
M.4.2.8. Classify and construct triangles, using ruler and compass, under conditions of certain measures of sides and/or angles.
M.4.2.9. Define and identify the congruence of two triangles according to criteria that consider the measurements of their sides and/or their angles.
M.4.2.10. Apply similarity criteria to recognize similar right triangles and solve problems.
M.4.2.11. Calculate perimeter and area of triangles in troubleshooting.
M.4.2.12. Define and draw medians and barycenter, mediatrices and circumcenter, heights and orthocenter, bisectors and incenter in a triangle.
M.4.2.13. Pose and solve problems that involve the identification of the characteristics of the lines and notable points of a triangle.

Table 4: Skills with math performance criteria that relate to technical drawing 10th and 1 BGU

Source: [18].

On the other hand The objectives were established for each quarter that these innovative practices will be applied

Next, the distribution of topics by units and quarters of this school period is presented, the same ones that are inserted in the ANNUAL EZQUEMATIZACIÓN that were presented to the Director of the area.

Quarter	Fountain	Objectives
1	Technical drawing 1	Acquire prior knowledge about basic technical drawing (Context Skills)
2		Acquire previous knowledge about the different designs and strokes correctly, which are used in numbers and letters in an informative writing, notes, drawings, signs or dimensions.
3		Apply in a basic way the scales and dimensions when drawing, from the review and analysis of the dimensions of the represented object, showing an attitude of respect and responsibility within the classroom.

Table 5: Quarterly objectives of the technical drawing.

Source: authors of the article.

Evaluation

According to the Instructions for the Student Evaluation of the Institution, which is adapted to the Instructions for student evaluation of ordinary educational services regime Galapagos Coast 2023 - 2024, through AGREEMENT No. MINEDUC-MINEDUC-2023-00012-A. The inputs must be adapted according to the pedagogical hours of each subject, that is, for mathematics within the 6 inputs 2 will be used, in the Cultural Artistic Education (ECA) that presents 4 inputs 2 inputs will be used for the Technical Drawing, which can be distributed as follows [19].

Quarter	Units	Topics
1	Introduction to technical drawing	General background (history of drawing, types of drawing, etc.)
		With instruments,
2		Strokes (concept and types).
		Lettered
		Technical calligraphy
3	Basic scales and dimensions	Scales
		Remarks

Table 6: Distribution by quarters and units of the topics of the technical drawing.

Source: [9].

Inputs	Description
1	Notebook/Book (Technical drawing)
2	Oral lesson
3	Individual activity in classes (Technical drawing)
4	Team activity

Table 7: Distribution of inputs/activities of the technical drawing.

Source: authors of the article.

Next, the heading of tentative qualification of technical drawing 1 is presented, which will be applied with slight modifications and more of a formative and stimulating nature.

Puntuality	**1 point**	**0.50 points**	**0.25 points**	**0 points**
	Submit the task or workshop within the time requested by the teacher	Present the notebook in the next class, after the time stipulated.	Presents the notebook up to 1 weeks after the stipulated time with the respective justification Approved by rectorate.	After 15 days of delay, it will be understood as not delivered and the notebook note will be 1
Presentation and cleaning	**2 points**	**1.50 points**	**1 point**	**0.50 points**
	It is stain-free, wrinkle-free and has no pencil marks	It is stain-free, wrinkle-free and has pencil marks	Has stains or wrinkles and pencil marks	Presentation is inadequate
Solution	**1 point**	**0.50 points**	**0.25 points**	**0 points**
	Correctly renders marked views and places them in position	Renders the marked views in position, but they have an error	Represents the marked views in position, but they have 2 errors	Represents the marked views, but they are not in position or have more than 2 errors
Representation	**2 points**	**1.50 points**	**1 point**	**0.50 points**
	Correctly use representation elements in measurements, parallels and curves, on all lines	Correctly uses the representation elements in measurements, parallels and curves, in all lines except 1	Correctly uses the representation elements in measurements, parallels and curves, in all lines except 2	Does not correctly use representation elements in measurements, parallels and curves
Dimensions	**1 point**	**0.50 points**	**0.25 points**	**0 points**
	They are standardized, none are missing and there is no redundancy	They are normalized, but 1 is missing or there is redundancy	They are not standardized, but none are missing and there is redundancy	They are not standardized, they are missing or there is redundancy
Layout	**2 points**	**1.50 points**	**1 point**	**0.50 points**
	It is homogeneous, it uses and distinguishes the 0.8 pen for the visible contour, the 0.4 for the non-visible contour, the 0.2 for the dimensions and axes of symmetry, it has no errors	It is homogeneous, it uses and distinguishes the 0.8 pen for the visible contour, the 0.4 for the non-visible contour, the 0.2 for the dimensions and axes of symmetry, it has no more than 3 errors	It is homogeneous, it uses and distinguishes the 0.8 pen for the visible contour, the 0.4 for the non-visible contour, the 0.2 for the dimensions and axes of symmetry, it has no more than 4 errors	It is not homogeneous, the pen cannot be distinguished, it has more than 4 errors
PERSONAL PRESENTATION	**1 point**	**0.50 points**	**0.25 points**	**0 points**
	He wears his full uniform, trimmed hair conveniently, neat	He wears his uniform incomplete, trimmed hair conveniently, neat	He doesn't have his uniform complete, your hair is not trimmed, neat	He doesn't have his uniform complete, your hair is not cropped, don't know "presents neat"
Total	**10 points**			

Figure 1: Rubric for the review of the activities/tasks of the technical drawing. Modified: [20].

Conclusions

Given this proposal, it is concluded that there is much evidence in recent years about the excessive use of technological devices by children and young people, especially in video games. Added to this, in the educational field, teachers manipulate these media for the development of their classes, keeping students more time in front of the screens where they develop their activities and academic tasks. Finally, the implementation of technical drawing began as a mechanism, where all students can perform a wide variety of oculo-manual activities, without leaving behind the educational benefits offered by digital technologies but less frequently.

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