SPECIAL COMMUNICATION

Learning experience with a virtual incubator for research on consultation-liaison psychiatry for undergraduate medical students (VIRTUE)

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Abstract

This report discusses the adaptation of a research incubator on Consultation-Liaison Psychiatry to a virtual environment, aimed at promoting research skills through experiential learning. Conducted between March 25, 2020, to June 15, 2021, in Cali, Colombia. The initiative was the result of an alliance between a teaching hospital and a medical university to foster research training competences in undergraduate medical students and psychiatry residents. Based on experiential learning principles, the programme used distance education tools to create a virtual research incubator that encouraged active engagement and collaboration. As the initiative progressed, students' interest, satisfaction and participation gradually increased, highlighting the potential of this approach. Overall, the virtual incubator proved to be a promising strategy to support research training by providing an accessible environment for experiential learning, project follow-ups and interdisciplinary collaboration.

Keywords: Experiential learning, Psychiatry, Medical education, Investigative techniques, Distance education.

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Introduction

Research represents a challenge in Latin America and is characterised by government funding with low-level investments. In this region, participation in research comprises a small proportion of the undergraduate curriculum. Imbalance is a cultural component "privileging the transmission of knowledge over its production".[1]

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Research incubators (RI) for undergraduate medical students represent a strategy that universities in low- and middle-income countries (LMICs) have established to promote medical research.[1-3] Experiential and other learning theories advocating true hands-on education are frequently employed in RI[4], allowing trainees to have an in-depth experience under the guidance of qualified tutors.[5,6]

The confinement due to coronavirus disease-2019 (COVID-19) pandemic heavily affected RI opportunities for students to participate in research groups.[7,8] The medical education process was forced to adapt or generate virtual and distance learning strategies (VDLS). Among the challenges in the way of implementing VDLS in underdeveloped countries, there were connectivity issues, lack of electronic devices, and limited technological infrastructure.[9] Other gaps were also uncovered, such as limited opportunities for online integration and limited chances of exchanging information in a timely manner.[10]

A variety of VDLSs were implemented by medical schools as they shifted to online education, where actors were usually separated in space or time.[11] These VDLSs are known to improve medical knowledge acquisition[12] but less is known about their impact on research activities. It was therefore necessary to explore if the implementation of VDLS through the virtualisation of an RI would facilitate experiential learning and promote research in undergraduate and graduate medical students.

The current case report was planned to illustrate the adaptation of an RI on Consultation-Liaison Psychiatry to a virtual environment that intended to promote research skills through experiential learning.

Materials and Methods

The study was conducted from March 25, 2020, to June 15, 2021, in Cali, Colombia, and entailed an alliance between Fundación Valle del Lili, a teaching hospital, and Universidad Icesi, a medical university, to promote and develop research training competences. The report used a single-case study approach organised with a modified Logical Framework methodology to describe a Virtual

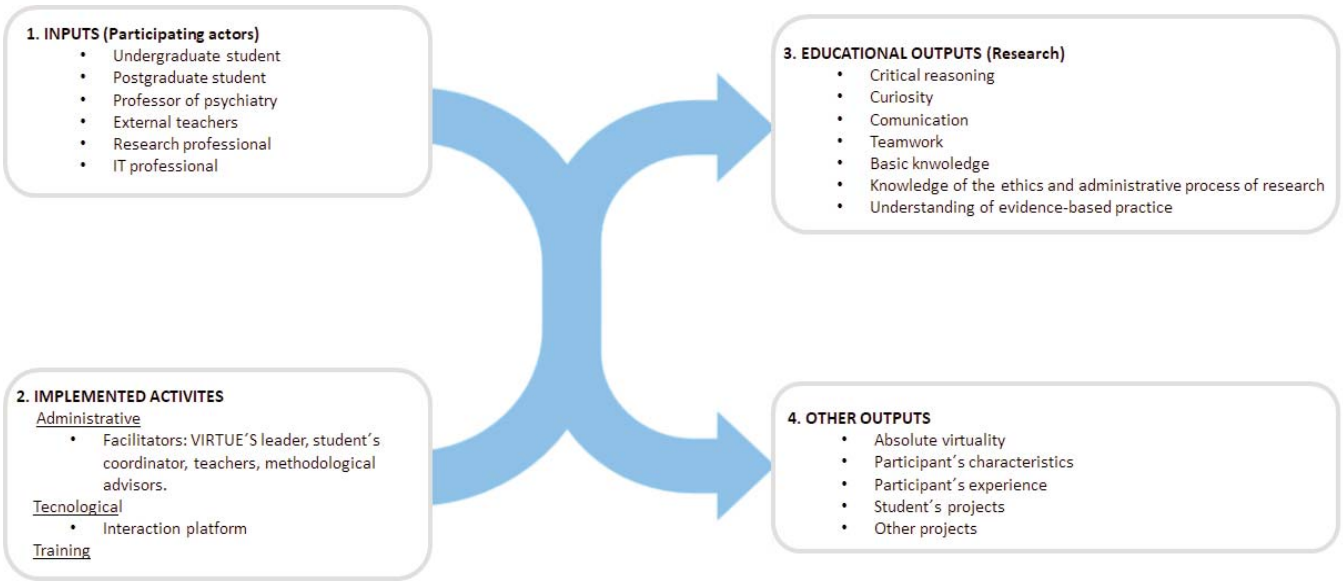

Figure: Logical framework of the VIRTUE.
VIRTUE: Virtual Incubator for Research on Consultation-Liaison Psychiatry Through Experiential learning for undergraduate medical students.

Incubator for Research on Consultation-Liaison Psychiatry Through Experiential learning for undergraduate medical students (VIRTUE) which has been explained in literature.[13] VIRTUE'S logical framework was grouped into four components (Figure). Six research competencies were established as educational outputs based on Laidlaw et. al.[14] The initiative was implemented using an online platform in collaboration between the two institutions.

Results

COMPONENT 1. Participating actors (inputs): Undergraduate medical students were fourth-year or higher-level students from a six-year training programme. They were in their early 20s and are the main actors within the RI. Their role was to propose, develop and collaborate on research projects. Students were recruited through voice-to-voice and digital resources (e-mail and others).

The role of postgraduate students (psychiatry residents) was to propose, develop and collaborate on research projects. All students were expected to invest 6 hours per week, equivalent to 10% of a 60-hours academic week. However, more time could be invested depending on interests and needs.

Professors of psychiatry were medical specialists in psychiatry with additional training (fellowship, master or doctoral), affiliated with the hospital or university. They were leaders of research projects, motivated students, presented their research's line results, and educated the participants on specific topics in their area of expertise.

External teachers were professors from other institutions. They were guests in discussions of topics of interest. They promoted and participated in alliances to develop short-, medium, or long-term projects. Time-wise, their participation was 1-hour per month.

The research professional was a member of the hospital's Clinical Research Centre (CRC). Their expertise included epidemiology, statistics and public health. This professional offered methodological, educational and administrative support for the projects.

Information and systems technology professionals were part of the hospital's Medical Informatics Department (MID), and were experts in software engineering. They fostered connections among students, provided training, and maintained the platform for virtual interactions that supported distance educational processes. Initially, this team dedicated 6 hours a week for 4 weeks while the VIRTUE activities' platform was stabilised. Afterwards, limited support was required for at least half-an-hour a week for 6 months and after, when requested.

COMPONENT 2. Implemented activities

Administrative roles were the ones that facilitated the executive functioning and organisation of VIRTUE.

Facilitators supported experiential learning as its main responsibility was to encourage the reflection on what was learned or could be learned from every experience. They led processes to achieve goals.[15] These included VIRTUE's leader, a teacher who had the initiative to create the RI and led other teachers. The time invested was 5

hours per week. Methodological counsellor was a CRC professional who advised students and professors in research methods planning during all phases of projects. Students' coordinator was an undergraduate student who facilitated peer communication and coordination.

Teachers were professors leading research lines and projects. They received a one-time incentive financial payment from the hospital and the university after research results were published. Time invested was 2 hours per week.

Technological learning and interaction platform for distance education was the Microsoft Teams, which integrated users, content and tools for virtual teamwork and meetings. The platform was used under a subscription paid by the hospital, with undergraduate students participating as guests. Initially, weekly meetings of the entire incubator group were established, and members who could not attend could watch recordings uploaded to the SharePoint platform for private use, only accessible with a link. For the writing and discussion, the interactive elements of projects, other cloud-based platforms, such as Google Drive or Dropbox, were used in parallel to Microsoft Teams meetings. In addition, a WhatsApp group was created for informal, non-patient-related communications. These activities allowed the entire group to remain in touch and connected.

Additionally, as a health institution, the hospital had to comply with legal regulations related to the confidentiality and protection of patient data. To this end, the platform was configured and administered by the MID, which allowed the secure management of information. Finally, the students and some professors (external to the hospital) were able to be included as formal users of the platform, where a team called "Incubator of psychiatry research: psychosocial conditions and Illness" was created.

Within the platform, different team channels were created, one for each research line or project in progress. Each channel had an online repository of all files for each project. In addition to a written version of the protocol or draft of the results modifiable online, everyone could observe the team's contributions in real time.

Furthermore, each channel had a chat service that allowed continuous communication among members of each project and a general channel to maintain communication among all VIRTUE members. Based on the tools offered by the platform, technology strategies contributed to optimise communication (organised, effective, confidential) and to strengthening teamwork, all essential elements for the successful execution of projects.

Training activities

Academic lectures: Delivered by local or external professors, these lectures explained a topic (line of research, project, results, or other related issues) to VIRTUE's members.

Research project training: This covered the different steps in preparing and developing a research project (literature search, research question development, protocol writing, data collection, information analysis, administrative procedures with institutional ethics review committee, article writing and submission for journal publication). Sessions were streamlined using platform tools and were carried out with the participation of professors and students.

Quality improvement projects: At teaching hospitals, there are frequent calls for improving patient-care processes. To this end, VIRTUE addressed the hospital's needs using a research approach. This resulted in two types of projects: writing evidence-based clinical care guidelines specific to the hospital, and creating and evaluating the hospital's quality improvement programmes (such as local or international guidelines) in both a qualitative and quantitative way.

Writing narrative reviews: Given the objective of writing research projects and quality improvement projects, it was essential that students learned to transcribe the scientific information that was to be published in a technical and engaging language that caught the reader and contributed to the construction of new knowledge, following the problem/gap/hook heuristic.[16]

Student tutoring sessions: There were sessions with students to listen and guide them to increase motivation and monitor progress in each project. Several methods for these meetings were proposed: individual or group; at regular intervals; or in response to requests by interested students to discuss an ongoing project, its progress, pending tasks, or publication issues, among other activities. It was intended to acknowledge peers as an important factor in the learning process, especially during experiential education.[4]

COMPONENT 3. Educational outputs: These outputs were the research competencies expected in VIRTUE's participants regarding exposure to educational activities. Competencies mentioned in literature were utilised as output indicators[14] and the expected contributions of every VIRTUE's training activity according to each

Table-1: Expected contributions of VIRTUE's training activities to each research competence.

Academic lectures (VIRTUE activity)	
Critical reasoning	During the conferences given by invited speakers, the participants were encouraged to critically question the topics and results presented.
Curiosity	The curiosity and creativity of the students were promoted through examples, references, or models provided by the presenting teacher.
Communication and Teamwork	Within the conferences, emphasis was placed on the internal process of the team that carried out the project described. In such a way, the participants learned to communicate the investigation in any of its phases and the ability to question, congratulate, thank, and observe the results as a product of teamwork, presented by a leader who served as a role model.
Basic knowledge	What has been learned was questioned, reinforced, and clarified through interaction with the speaker.
Knowledge of the ethics and administrative processes of research	A detailed explanation of the ethical and administrative processes of the projects was also given, serving as models for the students.
Understanding of evidence-based professional practice (clinical or research).	Finally, participating in the conferences led students to acquire first-hand information on articulating the evidence to support an investigation or clinical research activity.
Research projects (VIRTUE activity)	
Critical reasoning	Participation in research projects usually helped to cultivate the ability to problematize reality to generate research ideas, question immediate reality, and critically review the literature…
Curiosity	...leading to the opportunity for critical and purposeful observation of reality to identify problems.
Communication	In addition, being part of a research group made the participants understand the importance of transmitting ideas orally and in writing to generate the audience's interest...
Teamwork	...and to appreciate the importance of the team, promoting empathy, respect, collaboration, values, and ethics by understanding research as a process of articulating different roles in favor of the same objective.
Basic knowledge	Within this research incubator activity, knowledge of the mechanics of carrying out and presenting research project protocols to the ethics committee was learned, reinforced, and strengthened…
Knowledge of the ethicsand administrativeprocesses of research	...as well as the protection of human beings in research, good clinical practices, and the scientific integrity underlying each research project's idea before it was carried out.
Understanding ofevidence-basedprofessional practice	Finally, the competence to document projects based on proven scientific evidence-based information was acquired.
Quality improvement projects (VIRTUE activity)	
Critical reasoning	Participants had to find faults within clinic-administrative established processes to carry out quality improvement projects.
Curiosity	This was achieved by actively searching for places for improvement in established processes.
Communication and Teamwork	As in research projects, learning to communicate strengths and weaknesses and engaging in permanent confrontation with other positions was necessary to strengthen teamwork. In addition, the weaknesses of each team member had to be found, accepted, and improved.
Basic knowledge and knowledge of the ethics and administrative processes of research	On the other hand, reviewing basic knowledge was necessary to develop a quality improvement project along with the requirements and administrative procedures necessary to start it, considering ethical guidelines.
Understanding ofevidence-basedprofessional practice	Lastly, the participant had to identify aspects to improve according to the available scientific evidence and be competent in articulating this evidence to the clinical environment.
Writing of narrative reviews (VIRTUE activity)	
Critical reasoning	The participants acquired the ability to contrast and weigh the results obtained with those reported in the literature, critically analyzing the project's objectives to write about the results.
Curiosity	Participants used writing to find new ways to approach a topic. They fed their curiosity by looking at and finding varied and reliable sources. They have the freedom to generate and propose.
Communication	It fostered skills such as clarity and precision in expressing ideas and effectively conveying information. It contributed to improve the ability to listen and consider the perspectives of others in writing persuasive texts.

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Teamwork	Writing down the ideas generated during teamwork discussions, understanding leadership, and assess each team member's role and work. Adhering to international authorship norms as an application of the precepts of scientific integrity.
Basic knowledge	Students had to read to advance their prior knowledge to carry it into their projects. Learning by doing, writing draft articles, and know and structure its content.
Knowledge of the ethics and administrative processes of research	They learned to describe the ethical aspects of projects, including how informed consent was taken when required.
Understanding ofevidence-based professional practice	Acquired skills to describe and justify a project based on evidence and to explain research results. Understanding scientific articles as the accepted form of scientific dissemination among peers.
Student tutoring sessions (VIRTUE activity)	
Critical reasoning and Curiosity	The support sessions and participation in the writing of research and quality improvement also contributed to consolidating the behaviors mentioned. In the tutoring sessions, critical reasoning was stimulated through the reflections of the supervising teacher, promoting and contributing to creativity by suggesting ideas, which additionally contribute to the perception of empowerment.
Communication	Participants communicated their difficulties and strengths to the supervising teacher who supported them in learning from scratch to improve communication skills in all phases of research.
Teamwork	The supervising teacher also nurtured teamwork skills with individual and group supervision sessions, promoting team collaboration.
Basic knowledge Knowledge of the ethics and administrative processes of research	In addition, the teacher helped to change students' stereotypes about research, discussing diverse ways of applying basic knowledge, guiding, and supervising the ethical and administrative process necessary in each project.
Understanding of evidence-based professional practice	The teacher or tutor proposed and developed tasks jointly with the student(s), thus promoting the ability to integrate knowledge into all project phases.

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Table-2: Characteristics of the participants (2020–21).

Participants (number)	First semester 2020	First semester 2021
Undergraduate medical students	7	23
Graduate medical students	5	5
Teachers	3	6
Research Professionals	2	4
Non-medical undergraduate student	0	1

competence was targetted. Some descriptions applied to two contiguous competencies, while others were preceded or followed by suspension points since they were part of the same idea (Table 1).

COMPONENT 4. Other outputs: All activities were carried out in the virtual mode as a strategy to keep VIRTUE active during the pandemic. Other output characteristics were noted.

Participants in the RI: There were 39 participants in VIRTUE, including 23(58.97%) undergraduate medical students of different academic levels, 5(12.82%) graduate students, 6(15.38%) teachers, 4(10.25%) research professionals, and 1(2.56%) student from another faculty (anthropology) (Table 2).

Experience of the participants: To inquire about the experience of the participants, a set of questions in Google Forms was sent to all the participants via chat to provide a qualitative review of the experience. The questions were related to the participants' motivation to join VIRTUE, how it contributed to each student's personal training, and suggestions for improvement.

The following descriptions represent a summary of the responses:

Interest in participating in the incubator: It related to the desire to study neuroscience and conduct research in the future. Participation was aimed at updating and creating new knowledge. Sensitivity to mental health was evident.

Satisfaction with the incubator: Most participants were satisfied, citing the adequate organisation of VIRTUE, effective and timely communication, the opportunity to participate in projects and interact with psychiatrists with high professional backgrounds, and the possibility to access information at any time, as all meetings were recorded.

Suggestions: The most frequent suggestions were to implement movie discussion forums, conduct more reviews of academic topics, and teach more research strategies.

Perceived contributions of VIRTUE to the student's professional training: This was related to learning about the investigative process behind a publication, improving critical thinking, strengthening teamwork, and the impact of publications on their resumes.

Student's projects: There were 15 research projects active, with the participation of 23 undergraduate and 5 postgraduate students. All were involved in research processes, such as question formulation, protocol writing, and literature searches. Ongoing projects ranged from case report studies to innovation projects involving observational studies and scoping literature reviews. Five projects were undergraduate thesis works for 5 medical students and 3 psychiatry residents. All these students chose psychiatry as the topic for their final project to fulfil this graduation requirement.

Other products: The incubator generated several research products, including 6 book chapters, 2 health letters (strategies of knowledge communication in the form of newsletters aimed at users of the hospital), a proposal for innovation and improvement of processes (Delirium Management Guide for the hospital), a poster accepted in an international congress, a poster accepted in a national congress, and an article submitted for publication in an indexed journal.

Discussion

Virtual education and RI constitute important strategies for medical education[17], but in Latin America, incorporation has been slow and difficult.[18] During the COVID-19 pandemic's lockdown phase, the challenge was to keep the Consultation-Liaison Psychiatry research incubator running under conditions that required VDLS, while promoting medical research using experiential education.[1,19] The current case experience offers valuable insights about how the challenge was approached with the development of VIRTUE, using online synchronous and non-synchronous teaching activities.

With the implementation of VIRTUE, it was possible to cope with barriers described for face-to-face education programmes in LMICs.[20] like the perception of deficient training in investigation, the lack of experienced mentors, cultural differences, language barriers, time limitation, low support from university towards undergraduate investigation, limited local funding, inefficient communication between scientific groups in the university and administrative areas, and lack of incentives for students to get involved in investigation.[2,21,22]

The current case experience describes two integrated strategies not commonly applied in Latin American countries: an RI, and a distance learning education platform keeping an experiential learning theory approach. The whole learning experience fulfilled the aspects involved in the experiential learning cycle. First, a concrete experience was provided with a determined place and time. Every student was assigned to a research project that had its own timeline and milestones. Second, reflective observation was necessary for the fulfilment of research project activities, as students had to recognise what they already knew and what knowledge they were missing to achieve the project goal. Third, the concrete experiences lived by students provided knowledge that could be potentially used in other concepts or areas. And fourth, students could actively test what they learned in other conditions.[4]

Among factors identified as contributing to the satisfactory experience was that the university and the hospital had the technological resources to support the shift to virtuality, and to adapt VDLS, so a flexible and appropriate environment was available for actors to exchange knowledge and learn from each other regardless of their expertise.[22] In relation to the students, literature shows that they generally have a positive attitude towards incorporating communication technologies in the classroom since it can make the training process dynamic.[23,24] In this sense, all the teaching activities were gradually articulated into a virtual and cost-effective platform. This helped overcome obstacles inherent to the work of research groups, such as the availability of all participants in the same space at the same time.

In challenging times, like those experienced during the pandemic, passion was critical to the sustainability of the processes undertaken. In this case, the students' elevated level of motivation and interest in research and the psychiatry specialty was essential to conclude the proposed projects satisfactorily. The experience identified the need to balance the number of tutors and students to achieve an effective and permanent accompaniment in the totality of the projects.[25]

The role of the facilitator was fulfilled through the coordinators, the teachers and the research counsellors. Their work was supplemented by other research and IT professionals.

Experience in different countries and medical fields show that an RI can contribute to strengthening the competencies that are considered fundamental for undergraduate students: critical reasoning, curiosity, communication, teamwork, leadership, work planning, basic knowledge and continuous improvement.[14] In

LMICs, through hands-on mentorships or peer mentorship programmes, students can obtain additional elements of basic knowledge and, specifically, research knowledge that allows them to improve academically, and, as a result, have more opportunities for professional advancement. This way, the collaboration granted by RIs or mentorship programmes based on experiential learning provides foundations for greater research capacity and quality in junior researchers. Furthermore, a strategy like VIRTUE can perhaps enable students to explore their abilities, interests, passions and values.[22,26,27]

Strengths: VIRTUE consolidated spaces for the group construction of rewarding and motivating experiences, which allowed students to move from the mechanical approach of knowledge acquisition towards an experiential learning approach.[4]

The rapid growth in the number of participating students, with an increased number of active and completed projects was a positive sign. In addition, members valued the opportunity to take a hands-on role in executing and leading projects and participating in the process of publishing results.

The virtualisation of the research incubator contributed to the mentors' availability, strengthening their role and impact.[28] Additional gains included the proposal of innovative solutions to clinical-administrative issues within the teaching hospital. Given the results of VIRTUE at the institutional level, the teaching hospital's CRC hired a physician to assist all the projects in psychiatric research.

Limitations: Although the experience with VIRTUE offered an experiential learning scenario, its impact needs to be assessed in a controlled study, preferably with a long-term follow-up of the research competences acquired. The description of the contribution of every VIRTUE's activity to each research competence (Table 1) represented an expectation, but it will need quantification and validation in future studies.

Additional limitations include implementation on a single site, a small sample size, and availability of resources not always accessible elsewhere. Furthermore, the facilitators did not receive previous training for that role. Regarding the funding of VIRTUE's activities, the coordinators and the teachers were not paid for their participation in the RI, which is a disincentive. In this sense, allocating resources for mentorship training and activities might be beneficial. It is difficult to determine how much of the executed research activities were directly attributable to VIRTUE as opposed to the university's obligatory research requirement for undergraduate students.

Conclusion

VIRTUE was the result of institutional resources converging to cope with the barriers for research education that were imposed by the COVID-19 pandemic, combining the benefits of experiential, virtual and distance learning. It also acted as an alternative innovative solution to the difficulties observed when teaching research methods to undergraduate students. VIRTUE offered a welcoming scenario to learn, explore and practise hands-on newly-acquired research abilities. Finally, VIRTUE was found to be "an adaptable-to-evaluate initiative" to be further tested.

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HGRH: Concept, methodology, investigation, data interpretation, writing, supervision and project administration.
RFP: Methodology, investigation, writing and resources search.
MMCR: Writing-original draft and literature search.
JSPR: Concept, investigation, resources and writing-original draft.
PMCO & NLL: Writing and resources search.
LAEF: Investigation and resources.
SIPR: Concept, methodology, investigation, resources, writing-original draft, supervision and project administration.