v. 2, n. 6, 2022

International Journal of Health Science

EDUCATIONAL CENTER FOR TECHNOLOGICAL INNOVATIONS IN HEALTH: IMPLEMENTATION HEURISTIC

Iza Régia Azevedo de Carvalho
PPGRACI – Postgraduate Program in Surgery
Federal University of Amazonas (UFAM)
Manaus - AM
http://lattes.cnpq.br/8725103851238160

Fernando Luiz Westphal
PPGRACI – Postgraduate Program in Surgery
Federal University of Amazonas (UFAM)
Manaus - AM
http://lattes.cnpq.br/7831682850070733

Ivan Tramujas da Costa e Silva
(In memoriam)
PPGRACI – Postgraduate Program in Surgery
Federal University of Amazonas (UFAM)
Manaus - AM
http://lattes.cnpq.br/9640083128507793

Abstract: Goal: To identify an educational gap that, until then, had not been filled, considering the geographic context of the North Region as a whole and, specifically, the city of Manaus, that is, the absence of a Training Center especially focused on associated health education to the use of high technologies. The identification of this reality marked the objective of the research, to develop a strategic plan aiming at the implantation of an Educational Center of Technological Innovations in Health - Ceits, in the city of Manaus. **Method:** Mixed study, of a qualitative-quantitative nature, characterized by the foundations of socially critical action research, supported by strategic planning tools *brainstorming*, SWOT, Cross SWOT and Vector Field Analysis. **Result:** After identifying the strategic points, a second analysis was carried out to prioritize and better understand the action plans that must be developed in order to put the strategies into practice. **Conclusion:** It was found that the specific objectives were achieved, since the strategic planning elaborated was efficient in the sense of pointing out the strategies and actions necessary for the implementation of a Ceits in Manaus.
Keywords: Surgery, Simulation-based training, Medical innovations, Strategic Planning.

INTRODUCTION

This study started from the observation of the regional context, specifically in the city of Manaus-AM, related to health education with a focus on surgical practices, carried out by a Training Center especially focused on health education associated with the use of high technologies. It was observed that there is no Center with such specificity in Manaus, nor in the North Region, which represents an educational vacuum that has long been perceived by the academic community and that deserves specific attention. Since Centers of this magnitude only exist in the Southeast of the country, it becomes a complicating factor for professionals who live in the state of Amazonas to be able to update themselves scientifically in the large Centers, thus opening up a need to create innovative conditions. loco for continuing education in surgery, since surgical simulation can provide an opportunity to improve the experience gained in Undergraduate courses, in Medical Residency and in the exercise of professional life, intensifying training and optimizing the acquisition of new skills and maintenance competences (VLAOVIC; MCDOUGGALL, 2006). In general, behaviorist or constructivist surgical teaching in the classroom is combined with activities in outpatient clinics, surgical centers and wards, based mainly on the observation and execution of practical procedures adequately supervised by professors (PURIM; SKINOVSKY; FERNANDES, 2015). In practice, it means that huge investments have been made in recent years with the objective of accelerating national scientific and technological development, leading Brazil to stand out in several sectors of Science, Technology and Innovation - ST&I.

Osborn (1953) proposed *brainstorming* as a tool capable of increasing the quantity and quality of ideas generated in group contexts, used to test and explore the creative capacity of the people involved in the action. The *brainstorming* technique consists of a meeting of a group of people, who use their thoughts to generate as many ideas as possible, building an uncritical evaluation to take a given project forward (ISAKSEN; GAULIN, 2005). The steps of *brainstorming* are as follows (SCHUNK, 2012): defining the problem; generate all possible solutions without evaluating them; decide criteria to analyze possible solutions and select the best solution. SWOT is a tool

used to analyze scenario or environment, being used as a basis in the management and strategic planning of companies, but also of organizations in various areas, such as Health, Development and Education (DAYCHOUW, 2007).

The key role of SWOT is to understand all the factors that may affect the strategy of the planning and decision-making process (FINE, 2009). SWOT is short for the words: *Strengths*, *Weaknesses*, *Opportunities* and *Threats*, used in order to identify key factors that can increase strengths, seize opportunities, reduce weaknesses and threats, to establish goals and actions with positive impacts (FOJTIKOVA, 2014).

The main actors in this system are Science, Technology and Innovation Institutions (ICTs), public management entities and companies (BRASIL, 2018). Existing spaces can be remodeled, or new spaces identified for the construction of the Center, based on available resources (SACHDEVA; PELLEGRINI; JOHNSON, 2007).

The vector field analysis is a variant of the SWOT matrix (Strengths, Weaknesses, Opportunities, Threats) by Heinz Weirich (1982) that proposes to carry out a situational analysis opposing (crossing) Opportunities and Threats (relating to the environment external to the institution) with Strengths and Weaknesses (relating to the institution's internal environment). At this intersection, strategies, tactics and actions are proposed.

METHODS

The data collection instruments are a breakdown of the ideas raised in *brainstorming*; discriminative framework of the consensus on each of the components of the SWOT analysis; discriminative chart of the consensus on each of the components of the crossed SWOT analysis and structured questionnaires containing the importance of the creation of the Educational Center, how it must be implemented and constituted. The flowchart of the Strategic Planning methodology for the implementation of an Educational Center for Technological Innovations in Health in the City of Manaus is shown in **Figure** 1.

All the research participants' suggestions will be collected regarding the strengths and opportunities for the creation of the Technological Innovation Center and the weaknesses and threats, which may eventually prevent it, and which must be attacked, in order to, in the end, conceive proposal for a preserved solution for the effective implementation of the Center, so that an action plan will be prepared to create an opportunity for the implementation of an experimental surgery center based on simulation in the city of Manaus, focused on the use of technological innovations in the area of surgery and, by extension, health in general. The objectives to be achieved with the intervention will be outlined. The results obtained will be evaluated according to the significance in the validation of teaching through the simulation of technical skills outside the operating room and in the development of these technical skills through the opportunity to practice in laparoscopic simulators and in virtual reality. At the first meeting, the project will be presented by the main researcher and the meeting will be divided into 4 (four) stages. 1st Step: Clarification of the problem; 2nd Stage: Investigation of the Center's implementation ideas – *brainstorming;* 3ª Stage: Classification of the Center's implementation ideas – *brainstorming;* 4ª Stage: Formulation of the Action Plan. In the second meeting, the SWOT strategic planning – Survey of Strengths and Weaknesses (from the internal environment) and Opportunities and Threats (exercised by the external environment), choosing a conservative solution for the implementation of the Test

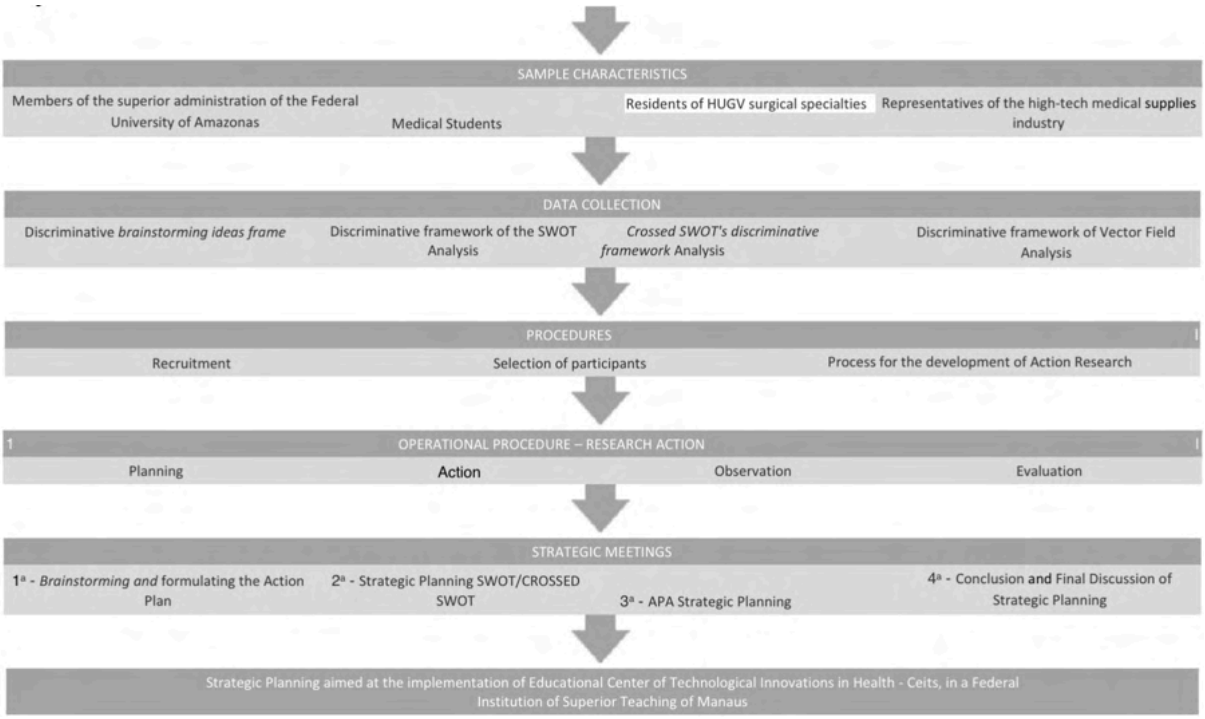

Figure 1 - Flowchart of the Strategic Planning methodology for the implementation of Ceits in the City of Manaus

Source: Carvalho (2022).

Core of Professional Training in Innovative Technologies in Surgical Environment. In the third meeting, Conclusion and Final Discussion of the Strategic Planning aimed at the implementation of the Educational Center for Technological Innovations in Health in the city of Manaus. Between the 2nd and 3rd Meetings, the Training Workshop on Innovative Technologies Applied to Surgical Environments took place, the results of which were evaluated at the 3rd Meeting.

RESULTS

This study elaborated a strategic plan for the implantation of an Educational Center of Technological Innovations in Health - Ceits in a Federal Institution of Higher Education in the city of Manaus. In view of this scenario, a strategic plan was developed, using tools validated in the literature to obtain knowledge of the strategies and action plans necessary for the implementation of the Educational Center for Technological Innovations in Health. Technological Innovations in Health were proposed as the main purpose. As a result of the first stage of strategic planning *brainstorming*, initial ideas were proposed: Is there an appropriate location in Manaus for the installation of the Center? Are there any advantages in associating the Center with a university environment? Who would be the instructors at the Center? What types of training could be implemented at the Center? What are the sources of funds for the implementation and maintenance of the Center? How must we start?

After the *brainstorming* meeting, the ACTION stage was carried out, in which a prototype of an Educational Center for Technological Innovations in Health was

carried out by developing a Videolaparoscopy Training Workshop, held on October 1st and 2nd, 2019 The Workshop was developed with support from Ethicon – Johnson & Johnson, Ebserh, through HUGV, and UFAM through the Faculty of Medicine, Propesp and Ppgraci. Obviously, CAPES was behind the scenes, encouraging the operation of Ppgraci. All respondents mentioned that they would participate in an Educational Center for Technological Innovations in Health in the city of Manaus, if it existed. **(Table 1)**.

All participants were in favor of the Manaus initiative to have an Educational Center for Technological Innovations in Health. Most participants considered the initiative important (52%) and necessary (33%). **(Figure 2)**.

For the open questioning about the opinion of the participants about Manaus having an Educational Center for Technological Innovations in Health, new possibilities and suggestions described in the **Figure 3**.

After the completion of the second day of training, questions were applied to all those enrolled and all participants considered the second training day to be fruitful (100.0%), this is because, more often, they considered the event an opportunity to obtain theoretical knowledge. and innovative practice in the surgical area (46.0%). 42% of the participants indicated the practical and theoretical classes on surgical materials as strengths of the Workshop (42.0%) and, as weaknesses, the logistics of training (29.0%). There was a 79% high satisfaction record related to the two days of training (2) **(Table 2)**.

After holding the videolaparoscopy training workshop as a prototype of the Educational Center for Technological Innovations in Health – Ceits and having described the effects of the action, in the monitoring stage, the next phase of the Action Research was to evaluate the results of the action. The SWOT matrix was applied observing its four components (strengths and weaknesses, related to the internal organizational environment; opportunities and threats, related to the external). This matrix made it possible to carry out a complete diagnosis and help to understand the scenario, understand the relevant points for the development of the project and strengthen the idea of creating an Educational Center for Technological Innovations in Health at a university in the State of Amazonas. It was built on the basis of the collegiate meeting. To advance the discussion, the exposed heuristic was proposed on top of what was experienced in the perspectives of creating the Educational Center for Technological Innovations in Health at a University in Manaus, more specifically UFAM, germinating center of all other Universities and Faculties in Manaus. Strengths, weaknesses, opportunities and threats were identified in relation to UFAM to face the new reality that is expected to obtain. In the next step, the SWOT Cruzado was carried out, in which the information was crossed to define the best strategy to be pursued. It was demonstrated how external opportunities and threats can be contrasted with internal strengths and weaknesses, so that it is possible to devise interesting strategies to equate a given problem.

DISCUSSION

According to the results revealed, the score by Gazzienelli et al. (2005), when they state that there are many models of health education, making it evident, however, that any combination of learning experiences, which seek changes in habits for behavioral improvement and for the acquisition of knowledge, contribute to achieving learning. truly significant.

Throughout the research phases, in line with the type of study established, it was

Questionnaires	Yes N (%)	No N (%)
Do you have training experience in surgical laparoscopy?	62,5	37,5
By the		
IRCAD – Latin America	88,9	-
Brazilian College of Surgeons	11,1	-
Does the person have a black box and videolaparoscopy training instruments?	75,0	25,0
Would the person participate in activities at an Educational Center for Technological Innovations in Manaus, if it existed?	100,0	0,0

Table 1 - Results of the application of the questionnaire to the participants (N=24).

Source: Carvalho (2022).

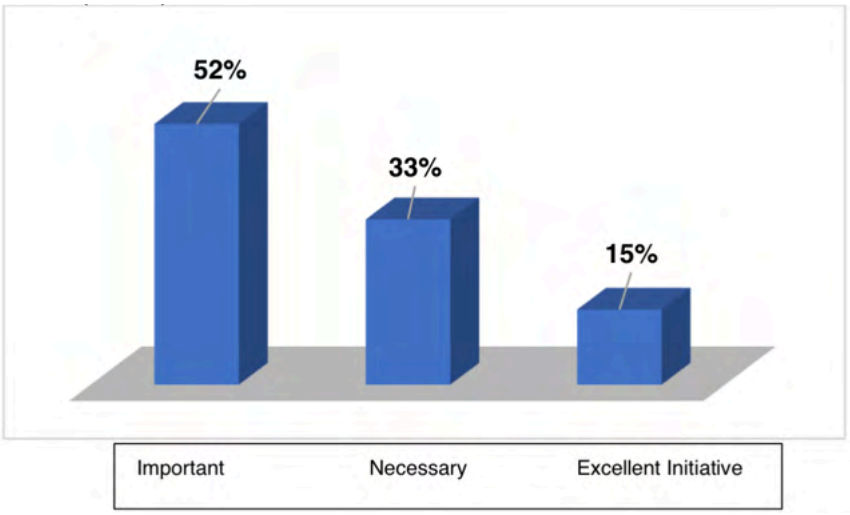

Figure 2 - Participants' opinion about Manaus having an Educational Center for Technological Innovations in Health (N=24).

Source: Carvalho (2022).

Higher frequency of this course in Manaus
More advanced contents
Training for different levels: basic, intermediate and advanced
Courses with longer hours
Include the course in the annual Medical Training agenda
To make endosuture materials available for the Medical Residency Services in General/Digestive Surgery.
To use animal tissues in the practice of endosutures, as experienced in the Workshop
Improved room acoustics
Smaller classes

Figure 3 - Interviewees' opinions about Manaus having an Educational Center for Technological Innovations in Health (N=24).

Source: Carvalho (2022).

Questionnaires	N (%)
Was the second day of the Videolaparoscopy Training Workshop fruitful?	
Yes	100
No	0
Why?	
Practical classes were enlightening	29
Enriching information for professional training	17
Opportunity for knowledge and manipulation of innovation in the surgical area	46
The person did not respond	8
What were the workshop's strengths?	
Endosutures course with simulators	29
Practical and theoretical classes with knowledge of surgical materials	42
Knowledge of the basic principles of videolaparoscopy	12
Innovation and training opportunity in Manaus	17
What are the Workshop's weaknesses?	
Not applicable	46
Facility logistics	13
Training logistics	29
Little training time	8
Little drills	4
On a scale from 0 to 10, how satisfied were you with the two days of the Workshop?	
Between 9,1 and 10,0	79
Between 8,1 and 9,0	8
Between 7,0 and 8,0	13

Table 2 - Results of the application of the questionnaires to the participants (N=24).

Source: Carvalho (2022).

also possible to verify what Ferrance (2000) stated when he said that collaborative participation between teachers, students and entrepreneurs is the keynote of Action Research. This statement was confirmed in the execution phase of the strategic planning called brainstorming, which took place at the 1st meeting, based on the Methodology of this project, when the participants, duly authorized, assimilated the idea of linking to an Educational Center for Technological Innovations in Health - Ceits UFAM, for being an ideal environment for training interns, residents and for the continued training of professionals in the area, as well as assistants and teachers. In such a way, which is what Sachdeva affirms; Pellegrini; Johnson (2007) when they say that the main focus of Training Centers is teaching, learning and formative assessment. These Centers have contributed to unlocking the full potential of simulation-based surgical education and facing many other challenges.

Another fundamental point discussed concerns the sources of funds and how work will begin at the Center. Existing spaces can be remodeled, or new spaces identified for construction of the Center, based on available resources (SACHDEVA; PELLEGRINI; JOHNSON, 2007). Thus, the group involved in the project indicated some possibilities: funding sources public-private partnership, for example, with Samsung, J&J, Medtronic, and/or H. Strattner (robotic surgery); adhere to public notices (Finep, Fapeam, CNPq), Ministry of Health; request support from parliamentary funds and also plead support with Ebserh/MEC. The second phase reinforced the veracity that surgical simulation can provide an opportunity to improve the experience gained in undergraduate courses, in Medical Residency and in the exercise of professional life, intensifying training and optimizing the acquisition of new skills and maintenance of competences (VLAOVIC; McDOUGGALL, 2006). In the business environment, despite the assertions mentioned by the participants, it was observed that Strengths and weaknesses are relevant or capable of facing the changes that may occur when an Educational Center is implemented with or without business dynamism. (JOHNSON; SCHOLES; WHITTINGTON, 2008). Opportunities compete for the company to achieve or exceed its goals and threats can harm the company and create obstacles for it to progress (RIBEIRO; KALLÁS, 2016). Simply putting strengths, weaknesses, opportunities and threats into a framework is underusing the potential that the SWOT matrix can represent (SPILLER, 2013). According to Harrison (2010), SWOT analysis can be taken one stage above, by practicing Vector Field Analysis, which identifies the vectors that drive changes to be made, as well as those that prevent them from being made — or that is, the vectors that act on strengths, weaknesses, opportunities and threats. When this state of affairs is reached, organizations are able to move from their current reality to a desired future.

To practice vector field analysis, we use the intersection of strengths and weaknesses with opportunities and threats and grades from 1 to 5 are assigned, with 1 representing the absence of influence of vectors of Strengths and opportunities to minimize weaknesses and nullify threats in order to achieve the desired objective and 5 representatives of the maximum vector of strengths and opportunities with the possibility of annulling weaknesses and threats and achieving the established goal. Note 3 would be the balance point between driving and stagnant vectors (Figure 4) (HARRISON, 2010).

According to Oliveira (2018), it is noted that the Development Strategy is the one with the highest score (39 points), with priority

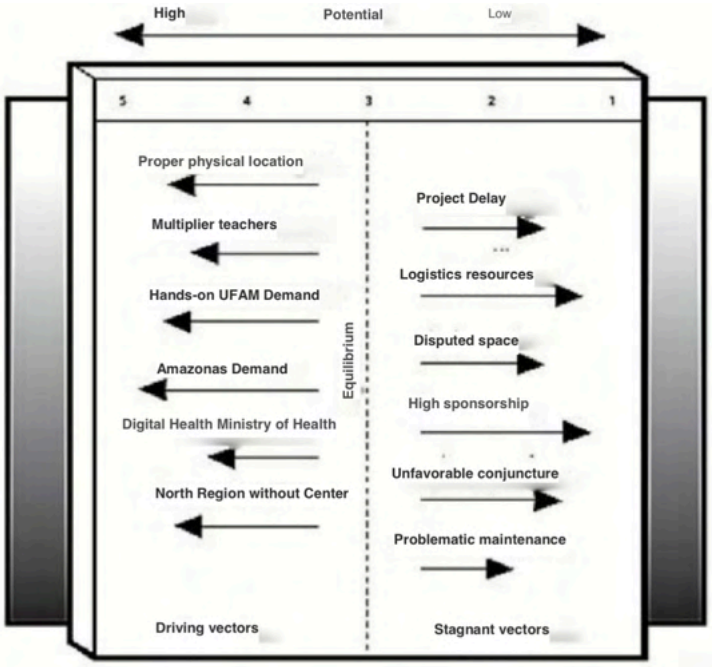

Figure 4 - Vector Field Analysis for the creation of an Educational Center for Technological Innovations in Health in Manaus.

Source: Harrison (2010).

being given to establishing strategies to implement the organization's Development. Some solutions are envisaged, as there is already a potential suitable place for the creation of the Center (4th floor of Cepes), which would solve the fact that there is no similar Center in the North region. Likewise, the high demand for training in technological innovation among health professionals in Amazonas, as well as the constant demand among health professionals at UFAM, especially HUGV, for hands-on training in the use of resources associated with technological innovations to application in health, are two needs that deserve immediate attention, even more in times when mass interstate mobility is repressed due to the COVID-19 pandemic, which could enhance the actions of the Department of Digital Health of the Ministry of Health regarding the dissemination of knowledge using digital media, since training courses at the Center could be conducted in a blended mode. The significant advantage that UFAM has in having professors versed in the use of technological resources, whose knowledge, skills and attitudes also represent a competitive advantage for UFAM to host the Center's facilities in Manaus.

What are the strengths of the companies that support future training that can be used to minimize the impact of threats? What to do to reduce threats with the use of forces? How to guarantee the maintenance of the Center? In this sense, the following Solutions are proposed for the Center's Maintenance and Survival needs: seek parliamentary funds (federal, state) for the creation of the Center and guarantee its maintenance, demonstrating the results of the Videolaparoscopy Training Workshop - Residents in Surgery, which took place on October 1 and 2, 2019; maintain the status quo and request sponsorship from UFAM and Ebserh so that health professionals from UFAM and HUGV can

regularly participate in training courses on technological innovations in health at other centers in Brazil.

CONCLUSION

In the present study, a strategic plan was developed for the implementation of an Educational Center for Technological Innovations in Health in a Federal Institution of Higher Education in the City of Manaus/AM. This process was conducted using validated tools, based on socially critical action research, supported by the strategic planning tools brainstorming, SWOT, Cross SWOT and Vector Field Analysis, emphasizing the strategies that can be adopted for the creation of the Educational Center. In the second phase of strategic planning, the action was carried out with the edition of the prototype of an Educational Center for Technological Innovations in Health, and its execution took place during the Videolaparoscopy Training Workshop, as a source of knowledge dissemination in hands-on and use of resources associated with technological innovations for application in health, thus outlining topics of relevance to implement the development of the organization. For each dimension of the strategies formulated, alternative proposals, directions and solutions for their implementation were also presented. The glimpse of these solutions will be used in favor of the main objective of this project, which is the creation of the Educational Center for Technological Innovations in Health – Ceits. Finally, what was achieved with the proposition of objective actions that could result in the creation of the Educational Center for Technological Innovations in Health in the UFAM environment, in Manaus/AM, was exposed. We saw that it is feasible to implement an Educational Center for Technological Innovations in Health in Manaus with the following proposed solutions: a) creation of a junior company formed and managed by undergraduate students of the Medicine Course and professors of the Medicine Course; b) development of a promotion project for the creation of the Center and delivery of professional training courses; c) creation of the UFAM Faculty of Medicine Foundation to raise funds from public and private funding sources; d) raising parliamentary funds for the creation of the Center and ensuring its maintenance.

REFERENCES

BRASIL. Ministério da Ciência, Tecnologia, Inovações e Comunicações (MCTIC). **Estratégia Nacional de Ciência, Tecnologia e Inovação 2016/2022:** Sumário Executivo. Brasília, DF: Centro de Gestão e Estudos Estratégicos, 2018. Disponível em: http://www.finep.gov.br/images/a-finep/Politica/16_03_2018_Estrategia_Nacional_de_Ciencia_Tecnologia_e_Inovacao_2016_2022.pdf. Acesso em: 9 dez. 2021.

DAYCHOUW, M. **40 Ferramentas e Técnicas de Gerenciamento**. 3. ed. Rio de Janeiro: Brasport, 2007.

FERRANCE, E. **Action Research.** Themes in Education. Northeast and Islands Regional Educational Laboratory at Brown University. USA, 2000.

FINE, L. G. **The SWOT Analysis**: Using Your Strength to Overcome Weaknesses, Using Opportunities to Overcome Threats. CreateSpace, 2009. ISBN 1449546757, 9781449546755.

FOJTIKOVA, I. SWOT analysis of the Czech Radon Programme. **Radiation Protection Dosimetry**, [s.l.], v. 160, n. 1-3, p. 35-37, 11 abr. 2014. Oxford University Press (OUP). Disponível em: https://docksci.com/swot-analysis-of-the-czech-radon-programme_5ae9c889d64ab2b1ed25be0c.html. Acesso em: 17 nov. 2017.

GAZZIENELLI, M. F. et al. Educação em saúde: conhecimentos, representações sociais e experiências da doença. **Cadernos de Saúde Pública**, v. 21, n. 1, p. 200-206, 2005.

HARRISON, J. P. **Essentials of Strategic Planning in Healthcare**. Chicago: Health Administration Press, 2010.

ISAKSEN, S. G.; GAULIN, J. P. A reexamination of brainstorming research: Implications for research and practice. **Gifted Child Quarterly**, v. 49, p. 315–329, 2005.

JOHNSON, G.; SCHOLES, K.; WHITTINGTON, R. **Exploring Corporate Strategy**. 8th ed. Harlow (England): Pearson Education Limited, 2008.

OLIVEIRA, D. P. R. **Planejamento Estratégico:** conceitos, metodologia e práticas. 34. ed. São Paulo: Atlas, 2018.

OSBORN, A. **Applied Imagination:** Principles and Procedures of Creative Problem Solving. New York: Charles Scribner's Sons, 1953.

PURIM, K. S. M.; SKINOVSKY, J.; FERNANDES, J. W. Basic skills for outpatient surgery in medical graduation. **Revista do Colégio Brasileiro de Cirurgiões,** [s.l.], v. 42, n. 5, p. 341-344, out. 2015. Disponível em: http://dx.doi.org/10.1590/0100-69912015005013. Acesso em: 17 jun. 2017.

RIBEIRO, F.; KALLÁS, F. **Utilizando a SWOT em Todo o seu Potencial**. 2016. Disponível em: http://kcd.com.br/arquivos/Artigo%20SWOT.pdf. Acesso em: 7 jan. 2021.

SACHDEVA, A. K. et al. Support for Simulation-based Surgical Education through American College of Surgeons – Accredited Education Institutes. **World Journal of Surgery**, v. 32, n. 2, p. 196-207, 2007. Disponível em: http://dx.doi.org/10.1007/s00268-007-9306-x. Acesso em: 16 jun. 2017.

SCHUNK, D. H. **Learning Theories** - An Educacional perspective. 6th ed. Upper Saddle River. NJ: Pearson Prentice-Hall, 2012. Disponível em: http://repository.umpwr.ac.id:8080/bitstream/handle/123456789/96/[Dale_H._Schunk]_Learning_Theories_An_Educational.pdf?sequence=1. Acesso em: 18 dez. 2018.

SPILLER, E. S. Matriz SWOT Entrecruzada: uma Contribuição para o Aperfeiçoamento do Método de Planejamento Estratégico da Escola Superior de Guerra. **Revista da Escola Superior de Guerra**, v. 28, n. 57, p. 180-199, 2013.

VLAOVIC, P. D.; McDOUGALL, E. M. New Age Teaching: Beyond Didactics. **Scientific World Journal**, v. 6, p. 2370-2380, 2006. Disponível em: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5917272/pdf/TSWJ-2006-6-801315.pdf. Acesso em: 9 ago. 2018.

WEIHRICH, H. The TOWS Matrix – A Tool for Situational Analysis. **Long Range Planning**, v. 15, n. 2, p. 54-66, 1982.