Review Article

The role of hackathon in education: Can hackathon improve health and medical education?

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Abstract:

To develop the next generation of healthcare innovators, students at all levels of education should be trained and encouraged to employ innovative and entrepreneurial approaches to deal with complicated challenges of today's health system. Applying innovation and entrepreneurship training to solve complex problems and focus on solution design has recently become common in medical universities all over the world. This paper clarifies the role of hackathons as an innovative educational approach in healthcare education systems. We propose a process model concerned with organizing hackathon events in the healthcare education system. This model can be used in the academic and practical design of hackathons for innovation purposes.

Keywords:

Education, entrepreneurship, hackathon, healthcare system, innovation process

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Introduction

The term hackathon is derived from "hack" and "marathon;" it dates back to 50 years ago when a programming contest was organized at MIT.[1] During the past decades, these contests have started in the IT community in the form of 1 or 2-day co-creation events including project managers, interface designers, and graphic designers. John Hopkins University (JHU) is the best pioneer academic center in developing a hackathon for healthcare and medical sciences. In 2018, JHU, in a collaboration with the American University of Beirut and Boston University, designed a hackathon program and implemented it.[2] Today, hackathons have gone far beyond the tech world and they have been expanded in education, creativity, corporate, and government sectors due to their pervasive character, the so-called "come-one-come-all ethos".[3] Hackathon events,[4] generally viewed as the innovation contest, can be considered as a unique form of these such contests).[5,6]

Currently, innovation has become a tool for companies to maintain their competitive advantage and survive in global markets.[7] The innovation process aims to fill the gap between the working life and educational framework,[8] so students can develop innovation capabilities they will need during their career. This literature emphasizes the collaborative discussion between healthcare education systems, students, organizations, society, and working life. The research methods in the innovation process have led to extending personal learning based on collaborative team-based and -networked learning in a multidisciplinary environment.[9] Newly, Porras *et al.* have stated their research on hackathons by using it as a method for teaching innovation in the healthcare education system.[10] Therefore, clarifying

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the role of hackathon events can pave the way toward improving healthcare education, especially in low- and middle-income countries. As a result, this article aims to elucidate the role of hackathon contests and their utility in the healthcare education system.

From the Innovation Process to the Innovation Contest and Hackathon

The innovation process includes several systematic steps, beginning from problem/requirement analysis and going toward idea generation, idea evaluation, project planning, product development, and testing. These steps, which are categorized into three phases, have different characteristics in terms of decisions and problems.[11,12] Researchers have introduced three main phases of the innovation process; these include idea generation, idea acceptance, and idea implementation.[13]

The approach to the innovation process in this field has created a wide range of problem-solving differences in various phases.[14] One crucial difference is the place of critical information and feedback. During the first phase (idea generation), information is linked to new approaches, or new ideas are related to marketing or technical problems that can be found most effectively outside the innovating organization.[15] In the second phase, more focused problem-solving requires exchanging substantial information within the R&D subunit, as well as between the laboratory and its manufacturing and marketing areas.[16,17] i.e., The third phase, implementation, requires effective coordination, and problem-solving among all functional areas.[18]

Innovation contests play an essential role in developing active education in universities.[19] These contests are employed for implementing the experience, skills, and/or creativity of the general public in an arranged event; they define a task or challenge to find a solution.

Some researchers have divided the literature regarding innovation contests into five perspectives: (1) management perspective, (2) economic view, (3) innovation, (4) sustainability focus, and (5) education. "Education focus" entails innovation contests that are "conducted with the primary purpose of motivating and encouraging students to develop the design, technical aspects, communication skills, and teamwork," which are mainly part of the introductory courses.[20] Alternative terms include "ideas contest" and "idea competition," along with "innovation contest".[20-22] Researchers have highlighted the particular use of the term "innovation," representing that a contest covers the entire innovation process, from idea generation to selection and implementation.[21] However, there are also different meanings of innovation contests. Some researchers have defined this term as "an innovation competition, a company (the seeker) facing an innovation problem (e.g., a technical R&D problem) sends its problem to a group of independent agencies (the solvers) and then awards the agency providing the best solution".[22]

One of the things that innovation contests (hackathon events) have always emphasized is industry–university–society communication and reinforcement of that relationship.[23,24] The methods of using innovation extend individual learning with networked learning and collaborative group-based work, often in a multidisciplinary environment.[8] It is often used as a tool for creatively solving a problem. Hackathons are sponsored by various organizations such as public institutions, nonprofit organizations, and private companies. Hence, for a private company, a hackathon can happen in the corporate environment, helping them to create and develop new product ideas. Further, organizations can use a hackathon to find and hire suitable specialists.[4]

Emergence of Hackathon Events for Healthcare Education

Hackathons are offline events that take advantage of online facilities. These events are organized in a centralized location with sponsors supporting a specific topic that has been defined by the organizer. Individuals come together to collaborate and participate in small teams. These teams are voluntary, and time is limited, ranging from very short to short, such as 1–2 days to a week.

Teams formally present the results of their innovations; evaluation is performed by a jury, announcing the winner of the event. The amount of complexity, participation, and rewards may vary at each event.[5,6] Hence, today, hackathons can be seen as a kind of innovation competition: A short-term randomized social construct for interdisciplinary competition, knowledge sharing, collaboration, learning, and networking for developing new ideas and investments. However, the impact of pedagogy must also be considered when using hackathons for innovation purposes.[4]

Most of the time, education-based innovation competitions are used and designed as a teaching tool whose design requires some essential features to be used. To achieve this goal, it must include significant course content, such as acquiring new knowledge and providing experience in identifying the key concepts.

Students need to be confronted with a plethora of ideas to foster their creativity. This design should enable intra- and inter-group learning, as well as the dynamics of group learning, providing a method for

consistency assessment. Besides, the event should be a strong motivating factor for students, and the goals of the competition should be considered from the program and course viewpoints.[25-27]

Recently, researchers have discussed various stakeholders in hackathons, such as companies, students, teachers in various groups, such as intra- or inter-organizational participants, students, or a combination of them. They have also stated that hackathons can be accompanied by the compensation or they may be free of charge; further, a sponsor can cover the costs of the event.[10]

On the one hand, previous studies have shown that experiential problem-based learning (PBL) can be utilized in teaching innovation in the healthcare education system.[28] Moreover, teachers in the healthcare education system could benefit from further development of PBL for developing innovation. More specifically, since a hackathon event also uses PBL, i.e., inquiry-based learning,[5] it can be used as a teaching tool for developing innovation at university. On the other hand, it is clear that the implementation of innovation contests such as hackathon events follows the innovation process, which is a scientific method to use innovation learning in the medical education process; the hackathon is one of the most reliable methods for this purpose. Nevertheless, there are only a few reports on the use of the hackathon as a method of education in innovation contests held in non-IT-teaching, especially in the context of healthcare education systems.

Process of Using Hackathon in Healthcare Education Systems

According to the theory of innovation contests, more specifically, entrepreneurship hackathons, we can propose a process model consisting of three stages for planning, conducting, and evaluating the hackathon in the healthcare education system [Figure 1]. This model has been found based on the context of healthcare education systems in university–industry collaboration and entrepreneurship for innovation training.

In the process of planning and directing a hackathon event, to convert ideas into startups, three main steps are defined: prehackathon, hackathon, and posthackathon.

The prehackathon stage begins with logistics planning after determining the theme and forming the executive team during this planning, such as providing equipment and files, training videos, and select sponsors. The creation of virtual and non-virtual communication channels to familiarize people with the meaning of the event, as well as advertising to encourage them to attend the event, is one of the most important aspects of this process. At this point, the mentors select and collaborate to identify challenges and also guide the participants in the development of their ideas during the event.

On the opening day, the event begins with a description of the challenges, and a workshop is held on the innovation tools to familiarize participants with the concept and rules of the hackathon event. At this point, the teams are formed and they start working. During this event, mentors are available to assist teams and referees make various evaluations of teamwork. At the end of the event, the final judgment is made and the winning teams are introduced. In the posthackathon stage, support and financing teams help select teams to achieve the product and startup, which is one of the most important parts of such events.

Furthermore, during this process, the event evaluation process plans by considering different dimensions. In the prehackathon stage, the relevant questionnaires are designed according to the topic and the tools and techniques used. At the hackathon stage, these questionnaires will be distributed and collected; at the posthackathon stage, the analysis and scientific results will be extracted.

Discussion

There have been increasing calls to incorporate creativity-centered approaches such as hackathons into science teaching[29,30] and medical education.[30] A frequently cited rationale for these efforts is to spur innovation in scientific research.[31] Despite many advances made in medical sciences and technology, the principles of teaching and learning are still traditional and they are mostly based on the principles developed many years ago. Innovative ways and innovative thinking about teaching and learning are, therefore, essential. Medical education practices have very specific strategies for maintaining quality in health. Medical education and training are, however, ineffective until students have a minimum knowledge (cognitive aspect), the minimum required skills (psychological/ motoric aspect), and minimum obligatory conduct values.[32] To this end, the goal is to use innovative educating techniques to improve and maximize learning by making learning fun for students, as well as mentors and professors. When students are involved in teamwork (as can happen in a hackathon), their interest is often aroused; as a result, they become more focused. Further, teamwork training techniques can reduce boredom. Further, mentors and professors can become more interested and enthusiastic in this regard. In this process, interesting and innovative techniques are obtained. Experiential learning, role-playing, competing and playing, brainstorming, and subgrouping that can be integrated with PBL approaches can help training of
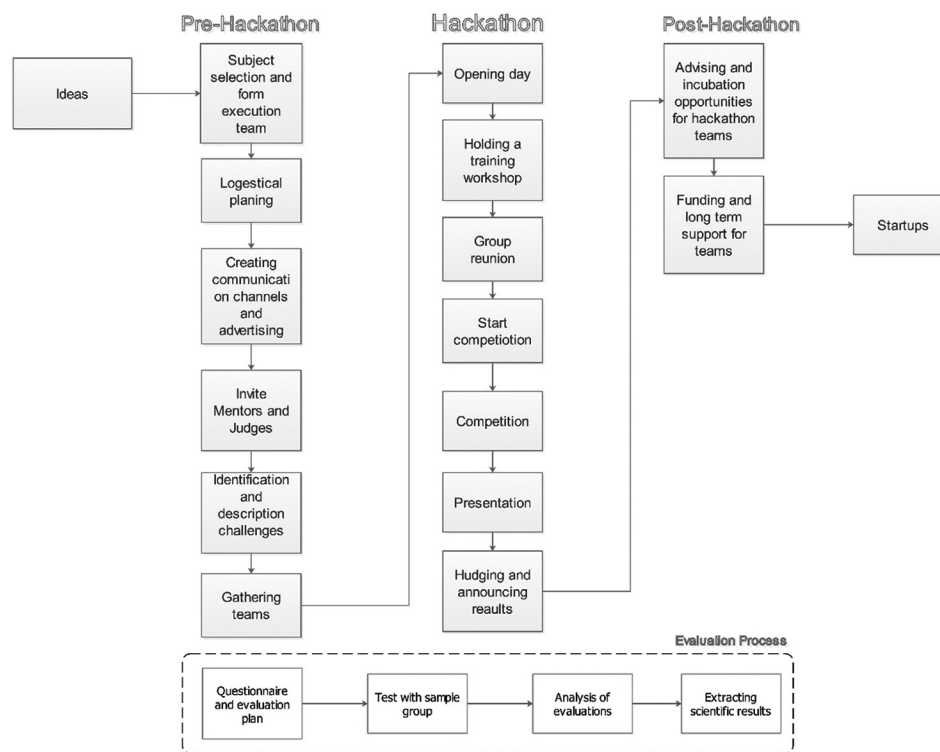
Figure 1: The process model of conducting the hackathon event in the healthcare education system

medical and health professionals. On the other side, time is one of the most important items in innovation training and therefore plays an important role in hackathon events. There is a commitment to the belief that this time is well spent and will pay off with improved and more enjoyable learning. Probably, the most important principle for innovative teaching is that it does not simply happen. Preparation is the key to carry out a successful session that can cover the desired material.

Thus, the hackathon event in the healthcare field system provides a structure for increased active learning. This event produces creativity and tries to promote team working between students. Due to the time limit of competition, students can quickly learn from their teammates and mentors to generate and design ideas. In these events, students learn how to manage and develop their ideas in a specific time development process and based on a short time frame. We have suggested a process model for conducting hackathon events in the healthcare education system; this includes three main stages: prehackathon, hackathon, and posthackathon.

Conclusions

Conducting a hackathon in the healthcare education system can create and reinforce active learning, creative thinking, multidisciplinary team working, innovation, and generation of new ideas. It also incorporates multiple knowledge processes of sharing, integration, and creation, as well as a learning environment that allows the students to exploit their factual and procedural knowledge in funny, motivating, and collaborative ways. In addition, the hackathons offer the students a chance to train the presentation skills of pitching, which is currently a vital skill for professional life in all branches. Overall, we can conclude that running hackathon in the prehackathon, hackathon, and posthackathon stages is a functional method for teaching and learning according to university–industry collaboration in the healthcare field, providing pedagogic ideas that can improve teaching this field.

Conflicts of interest

There are no conflicts of interest.

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