Analysis of the decision towards the establishment of a robot lab adapted to the century (21) in private schools

Raed Awada
Ph.D. Student / Educational Administration Program
Arab American University
Dr. Muhammad Imran
Head of the Department of Educational Sciences
Arab American University

Abstract
This study aimed to identify the importance of establishing a robot laboratory compatible with the challenges of the 21st century, whether in private or government schools. It also aimed to identify the role of the robot in the educational process and what it provides attractive tools to simplify the understanding of concepts positively and effectively. The study contained a feasibility study to create a laboratory Robot, and the researcher used the methodology of decision analysis through the philosophy of decision-making models (influence charts and decision tree) within the limits of his knowledge and knowledge.
The results of the study showed the following:
The theoretical framework for the effectiveness of building a robot laboratory at the school was revealed.
• Integration of the robot with education using the modern methods of the 21st century, due to the attraction of the love of study by students, especially in the elementary stage.
• Contributing to the development of positive and recent trends towards the concept of robot education in education, and changing negative trends if they exist.
In light of these results, the researcher recommended the most important recommendations:
1) It is very important to use decision analysis models (decision tree, impact diagrams) for ease of use, dealing with alternatives, and reaching the best possible decision.
2) Decision trees and influence diagrams complement each other, as they work as one spirit to make the right, appropriate, and quality decision.
3) Influencing schemes and decision trees deal with ambiguity and suspicion, and this facilitates the appropriate decision-making process by drawing logical relationships between all elements for foresight.

Study background

Given the importance of technological development in primary education in a distinguished position, it is therefore necessary to determine the importance of robot education and the development of students' skills mentally, skillfully and emotionally, so it is necessary to provide technological content using modern and advanced educational technology and concrete examples of concepts, theories and laws, and to link learning topics Teaching in daily life through an educational environment that achieves positive interaction and internalization of concepts in the minds and minds of students with the ability to scientific

and practical application of new skills, with an emphasis on the desired values to achieve the required goals.

And based on some indicators that appeared to the researcher through meetings with computer teachers, completion courses and visits to some schools, which showed that the use of educational technology tools in teaching educational materials at the primary level did not reach the required level in schools, which gives an indication that it is a reason for the lack of outputs Education to the desired level.

Hence the idea of this study, through which the researcher seeks to identify the importance of applying and using the educational robot as an educational tool in teaching educational materials to raise the level of achievement in the primary stage, and that educational development can only be achieved on a scientific and accurate basis that reflects reality and provides a clear vision. It helps in proper planning and control of high quality educational outcomes, and through the researcher's experience in teaching at the primary level for several years, for example: he touched a number of problems with students in memorizing the multiplication table, which leads to a decrease in the students' achievement level in mathematics.

Introduction

In light of the tremendous technological revolution that we are witnessing in recent years and contemporary changes, we note that technology has a prominent role in this, as new branches of technology have emerged, and methods of teaching educational materials have changed, focusing on skills in various arithmetic operations and the ability to solve problems and reach higher levels of thinking. Where the Ministry of Education is working hard to find and provide new and distinctive methods and strategies for education in order to reach the best results for the performance and achievement of students, and to prepare a generation capable of keeping pace with technological development, the information revolution and the ability to compete for local and global labor markets.

Through the researcher's work in a computing center in the school for several years, he found that the robot has a very important role in teaching because of its attractiveness to students, and its support for active and effective learning in our time, and students can link between the information and concepts they have learned, develop their knowledge and increase their understanding of the method controlled by science and technology tools in the current world in which they live.

Robotics does not aim to graduate specialists in robotics, but rather to help students understand the engineering design of robots and the digital world that helps operate them and achieve the goals of science. Good and effective programs for the movement of the robot, and it is also important that a qualified mathematics and computer teacher be available through continuous training courses to follow the changes that occur in the future. In addition to solving problems, and by observing the researcher, he found that it helps the use of analysis, conclusion, evaluation, application, generation of questions, generalization of ideas, problem solving and criticism.

The educational robot helps the teacher to apply the theory of student-centered learning and take into account individual differences, and this helps students to rely on themselves and

encourages cooperative learning for them, by involving them in projects and asking them to implement them based on previous experiences and what they obtain through the existing and available knowledge sources, Connect what the student learns to practical life
Teaching using the robot is an opportunity to train students on invention and innovation, and this is one of the basic education requirements that are frequently circulated among those interested and specialists in the field of education. All industrialized countries have been keen to introduce innovation and invention into their curricula. Through what they implement of practical projects and trying to reach new results or invent modern devices, develop ideas and discuss them with their friends.

Study Problem

Learning through computerized applications has achieved a distinguished position in the primary stage, which leads us to the importance of learning through effective tools adapted to the 21st century and help in the formation of students mentally, skillfully and emotionally. Therefore, it is necessary to provide educational content through concrete models and examples of concepts, theories and laws To simplify the understanding process for students with an attempt to link all these concepts to daily life in an educational environment that achieves students' positive interaction with the content presented with the scientific and practical application of new skills, with an emphasis on the values and trends to be achieved.

The great expansion in the fields of information technology contributed to the focus on developing innovative thinking skills and strategies, for example the emergence of interest in problem-solving strategies as a way of learning, developing creativity among students, and changing the style of education to center around students (Al-Aqeel, 2015).

The problem of the study emerges, as the researcher noticed through his work for several years in primary schools, that there are difficulties in communicating, understanding, preserving and applying information by students, due to the use of boring traditional methods and methods. His achievement in all subjects, and his ability to solve problems.

Study questions and hypotheses

The idea of this study came that the researcher seeks to address and analyze it through decision-making models (influence charts and decision tree), and to highlight the importance of having a robot lab in the school because of its interesting elements to attract the student towards a love of learning and bring scientific concepts closer to him, and taking into account individual differences, And that the student invests all what he has learned (previous experiences) and employs them to build (install) and program the robot, which generates excellence, creativity and innovation for him.

Through the researcher's experience in teaching computer science to primary school students for several years, he touched a number of problems with students in understanding and memorizing the multiplication table, which leads to a lower level of students' achievement in mathematics, for example, especially in solving various mathematical problems later

Study Questions

1) What are decision-making models (impact diagrams and decision trees)?

2) What is the role of influence diagrams and decision trees in decision analysis?

3) What is the relationship between influence diagrams and decision tree in decision analysis?

Study Objectives :

The study seeks to achieve the following objectives:

● Revealing the theoretical framework for the effectiveness of creating a robot lab in the school.

● Learning using modern methods adapted to the 21st century that attract students to a love of study by integrating robots in education.

● Contribute to the development of positive and modern trends towards the concept of robot education in education, and changing negative trends if they exist.

Theoretical framework

The theoretical framework includes the concepts related to the effectiveness of creating a robot lab in the school, as well as Arabic studies and foreign studies related to the subject of study.

the importance of studying :

The importance of the study is as follows:

1) It is one of the first Arab studies concerned with decision analysis towards establishing a robot lab using models of influence charts and decision trees, within the limits of the researcher's knowledge.

2) This study may help the developers of the technology curriculum by highlighting to them the importance of establishing a robot lab in schools for the new curricula when it is formulated.

3) This study may contribute to helping the decision-maker benefit from establishing a robot lab and employing it in the educational process.

4) This study may contribute to the development of students' abilities in dealing with modern tools through practical practices, and the formation of positive attitudes towards them.

Study Terminology :

Android definition:

It is an electronically controlled mechanical machine according to a program recorded inside the electronic brain (Al-Haba, 2010).

The robot consists of:

mechanical components

electronic components

electrical components

computer (programming)

educational robot:

It means the robot (the robot), which is a mechanical device capable of carrying out pre-programmed tasks, and the robot accomplishes those tasks, and the tasks that the robot is programmed to perform are usually difficult or dangerous tasks, such as searching for mines, outer space, and cleaning the resulting waste. In nuclear reactors (Al-Hababah 2010).

The educational robot consists of several parts that perform their tasks by following a set of instructions saved in the electronic memory of the device, and these commands are designed through specialized computer software, and are connected to the parts of the robot.
Robots are among the modern technologies that have gradually begun to take a prominent place in all fields. In 2008, the number of service robots exceeded the number of industrial robots. Also, the robot began to enter the daily life of individuals at school and at home, and the very important social effects it had on children and adolescents. It helps in their cultural and educational development and growth, and therefore attention must extend to making the educational robot in harmony with the lives of students, and provide them with every scientific benefit, with the continuation of technological development
(Bennetti, 2012).

Study limitations:

This study was limited to the following limits:

1) Human limits:. Fourth-fifth-sixth graders.
2) Time limits: the second semester of the year 2020-2021.
3) Spatial boundaries: private schools or government schools.
4) Objective limits: analysis of the decision towards the establishment of an additional laboratory adapted to the 21st century in the school
5) Procedural limits: they are limited to generalizing the results according to the analysis used, the accuracy and nature of the answer to them, which were mentioned in the study, and the decision analysis models that the researcher used in order to reach the best decision.

Previous studies :

Al-Hadabi Study, Al-Hajji (2011): The robot can be used in the educational process to achieve the following:

1) Student participation in the educational process (student-centered education)
2) Teaching the principles of science and mathematics through experimentation.
3) Enhancing science and mathematics education through the student's continued learning of the robot.
4) Learn the principles of engineering sciences, by designing robots in different shapes that fit the goal to be accomplished.
5) Learn programming by programming a robot with the aim of carrying out a specific task.
6) Encouraging cooperative learning through student work in teams and groups.
7) Develop problem-solving skills by building and programming a robot to solve a problem.

The robot has been introduced as an educational tool in many schools in the world, because it provides an encouraging environment based on self-learning and manual work, integrating science and learning through experimentation, and providing creative solutions to problems.

In a study (Eguchi, 2014) it was found that the robot encourages and develops manual work skills, because robotics is a practical and applied science, where students invest all the information and previous knowledge they received theoretically through the materials and curricula, and thus the program focuses on the direct applied aspect of education, and needs

The students are taught to use the tools, parts and units in the educational bags to design the robot body, and this increases and supports their knowledge, in addition to their learning to design a mechanism and how mechanical and electronic machines work, through their actual practice of assembling different machines.

Chie, Chang, Yu & Chu (2016) study: This study indicated that the innovative problem-solving strategy (TRIZ) has a positive impact on the student's ability to analyze problems, reach and implement appropriate solutions. Where students were able to develop designs and software for robots, and implement new ideas, and the innovative problem-solving strategy (TRIZ) goes back to the Russian scientist Genrich Altshuller, and this strategy was known as having a systematic basis.

Nada on a clear cognitive basis that directs people to solve the problem (Dung, 2001) and the innovative problem-solving strategy (TREZE) aims to develop students' thinking skills and increase their motivation towards solving the problems they face. This strategy is characterized by the fact that its creator did not rely on trial and error in its formulation, but rather relied on accurate scientific analysis of thousands of patents until he reached a set of innovative problem-solving strategies (Siyam, 2013). The field of education was concerned with diversifying learning strategies such as problem-solving strategy instead of focusing On the traditional education, which is represented in the levels of memorization and remembering, putting students in front of a real problem that they felt and lived through provides them with opportunities to understand, use, and apply in similar situations that they may encounter in their lives. Without direct access to the solution from the first time (Hipple, 2002), and this appears precisely during the practice of installing and programming the robot, as the students face several problems that require them to think carefully, and find the appropriate solution among a group of possible solutions (Al-Bedouin, 2017).

From the above, the innovative problem-solving strategy (TRIZ) presents the studied methodology for solving the problems surrounding the educational process, and the teacher’s knowledge of this strategy is a qualitative leap in the teaching environment because of its impact on students, and this strategy is consolidated by them through its practice, thus saving time and effort during Problem Solving.

The robot is considered one of the advanced artificial intelligence techniques, because its multiple applications provide it with complete solutions to the problems that students can face in their lives through the practice of innovative problem-solving strategy. Besbas, 2015).

(Bartneck, 2011) Study: The robot connects learning with practical life, because most of the educational projects and applications presented in robot laboratories are real examples that the student lives in his daily life, such as (the smart door project, or the ATM, etc.), which makes the student learn more through his understanding and application of a mechanism Making machines and devices that he uses daily, and linking them with what he learns while in the robot lab.

(Wagner, 2012) Study: The link of the robot with engineering, technology and innovation has made many global reports carry with it one message for all influential leaders, urging them to develop innovation among students at an early stage of their lives, for example, if these countries want to catch up with the developed world or continue with it and compete in

aspects of Different science and technology, it must teach based on the development of innovation skills that leads students to find the passion of academic exploration, which has developed over time, to cause a further deepening of the sense of purpose, and this is what generates motivation and passion for learning.

Commenting on previous studies:

Previous studies dealt with aspects of the current research from different angles, and the current research agreed with most of the studies, and that this research provides a perception of the importance of having a robotic laboratory adapted to the challenges of the 21st century in education and the extent to which students benefit and need to use digital learning techniques in the education process and their attitude towards it. The current research has benefited from previous studies in some aspects, including: crystallizing the study problem, defining its objectives, clarifying its importance, analyzing the study method, and linking the results of previous studies to the current study, which achieves coherence in the field of scientific research.

Our world today is also witnessing great development and rapid technological progress in the field of science and technology, as developed countries are making rapid strides in this field. Traditional methods such as memorization and indoctrination, and the use of modern technologies in education. Technology has given new horizons in learning and teaching, providing the teacher with techniques that can be used to enhance education and increase students' educational attainment **(Al-Dwayri, 2014).**

Through the robot, the student can invest this in acquiring many skills such as: problem-solving skill, and this leads students to develop robot designs and software, and implement new ideas, in addition to linking what they learn to practical life, which is reflected positively to generate motivation towards a passion and love of learning.

Based on what the researcher has learned from previous studies, the integration of the robot into the educational process, with the interactive applications it provides that simulate the generation in the 21st century, makes the educational environment attractive and interesting and suitable for the different abilities of learners, as it takes into account the individual differences of students, and there is no doubt that their interaction with The lesson by arousing interest and attention, and increasing the students' ability to self-perception and understanding, and thus the speed of learning, which is reflected in the cognitive achievement in a positive and effective manner.

Methodology:

This chapter includes an analysis of the configuration of a robot laboratory with high specifications and in line with the requirements of the 21st century through the philosophy of decision-making models (influence charts and decision trees) by answering the study questions:

Q1: What are the decision analysis models (decision tree and impact diagram)?

decision tree:

✔ They are possibilities to manage suspicion by consulting experts to give accurate judgments.

✔ The decision tree presents a method that includes probabilities in an organized manner; The graph is used, for example:

- The squares indicate a decision.
- The circle is a sign of suspicion.
- The triangle is a sign of expected outcomes or consequences.

This is done using the computer.

The decision tree is a logical method for containing uncertainty about profit or loss. And how much this uncertainty gives us probabilities; Thus, it has a direct effect on the output. It is logical to consider the decision tree as a causal relationship; Each movement of the tree causes another set of values, whether profit or loss; This relationship runs from left to right, and every change in the tree causes a change in the results later.

Decision trees have the ability to fine-tune sequencing of decisions and uncertainty more than influence schemas.

A decision tree provides us with options and a presentation of the problem without providing a final solution to the problem.

Impact charts:

It is the appropriate tool to help define and identify the influences and areas of uncertainty. It is the tool to depict the decision problem graphically. We can see the relationships related to decision-making. This chart serves as a link between team members and the decision-making board.

Impact charts are a very powerful tool for showing all sides of the problem on one page; It also gives us clarity in the decision, and therefore it is a tool to reduce ambiguity and the relationships between uncertainty and values and points of decisions are clear; It helps people who are unable to clearly understand goals.

Impact charts give us the value of focusing on the real problem; When making an analysis, choose the main problem only, and it is chosen from among only 3 alternatives; The schemes begin with the criteria of values. The schemes of influence must begin with accurate information (the goal of communication) with the decision-maker and interaction with suspicion and values, which are relationships; It is a wonderful mental initiation to determine uncertainty and the nature of relationships with each other and to choose the appropriate value; It is an art based on knowledge and gives us an opportunity to discuss the problem with the administration and has the ability to barter in clarifying the goals.

- **There are 3 types of impact schemes:**

✔ Demo Chart

✔ Prototype

✔ Final Form

Table (1): Comparison between impact charts and decision tree

decision tree	effect charts

A graphic technique used to deal with decision-related uncertainty, including probabilities and sub-decisions.	A graphical style that illustrates the problem, uncertainties, and desired values.
It begins with a decision complex with the aim of finding the best way to achieve it.	It starts with the value node or the result that is supposed to be achieved.
It starts from where the results of the impact plans ended, and aims to find the best path to implement the decision.	They are used at the beginning of the decision analysis process, to ensure clear identification of objectives, and the possibility of trade-offs between alternatives and options.
They are not paths that indicate the flow of information, so that the most appropriate values are found for each possibility, and move to the next step without going back.	They are not paths that indicate the flow of information, in the sense of moving from one step to another without the possibility of going back.
Each decision tree deals with only one major uncertainty area (only one possibility or option).	Impact schemes may result in more than one major area of suspicion (possibility or option) to achieve the goal, provided that it does not exceed three.
It deals with uncertainty and possibilities that would dispel ambiguity regarding the outcome and consequences of a decision.	It deals with complexity and ambiguity to remove it by defining and clarifying the goal.
Uses names and geometric shapes similar to the effect diagram.	Uses names and geometric shapes similar to the decision tree.
It refers to the succession of decisions and areas of uncertainty to reach the desired decision, taking into account all possibilities and possible options for each area of suspicion or possible option.	It divides the areas of suspicion into small parts, down to the fragmented fragmentation, to dismantle each area of suspicion separately, and keep everything related to it and delete the rest to prevent dispersal.
A causal relationship, in which each step leads to a next step, and the transition from one stage to another takes place sequentially.	Relational link between all the doubts and internal and external variables.
Go from left to right in the steps of representing the problem.	Go from right to left in the steps of solving the problem.

Q2: What is the role of influence charts and decision trees in decision analysis?

1) The role of influence charts in analyzing and addressing decisions:

● **The first step:**
We explain the goal to the work team and educational experts, as the establishment of the robot lab will achieve an increase in the number of students in the school (financial) in addition to raising the level of students' academic achievement (moral).

● **The second step:**
Defining the problem (the goal) in cooperation between the work team, experts and specialists, through which the best ways for the success of the idea of implementing the project are clarified and by answering a question: What are the aspects of the returns or benefits of establishing a modern robotic laboratory for students and the school as a whole?
The options (areas of uncertainty) were as follows: Establishing a robot lab, a science lab, or an imaging lab.

● **The third step:**
At this stage, the moral and material value is accurately determined for the implementation of the project. In our example, the moral value (increasing the level of achievement of students) and in material terms (increasing the number of students in the school in the near future in addition to improving the school's reputation and competition with other schools)

● **Fourth Step:**
A set of questions is asked between the decision maker and the analysis team, to see which of the three options achieve the two values together, such as what is the desired societal benefit for each option? What are the chances of competing with other schools? How many students benefit from each option? Which options are more good in education? What are the profit opportunities for each option? In addition to another set of questions that would dispel doubt regarding the identification of both objectives (material and moral value) together. And after determining the information required to dispel doubts about future results, and the expected values, material and moral. The following results were initially obtained:

❖ **Robot lab:** achieving the objective/the material and moral values.
❖ **Science lab:** achieving the objective/the material and moral values.
❖ **Photography Lab:** It achieves the material value of the target.

In light of the above, the photographic laboratory option has been excluded because it does not achieve the required moral value for students. The two options for the laboratory (Robot and Science) were retained because they achieve both material and moral values.

● **Fifth Step:**
Working to identify areas of uncertainty associated with the supposed values (value node) to be achieved from the primary goal (material and moral return), and areas of uncertainty in this case are related to the robotics and science lab, and both returns, of course, give the required moral value to students. Therefore, work is being done to identify the areas of uncertainty for each of them. For the robot lab option, a set of questions were asked: Is there another school in the area that might constitute a subsequent competition? Is there a suitable room for setting up a robot lab in the school? Is it possible to build a robot lab with appropriate specifications within the amount allocated for investment? Will the Ministry of Higher Education agree to adopt and approve the project? In addition to other questions related to this option, which represent ambiguity (doubt) affecting the possibility of achieving the material value required from the project. The same applies to the science lab by asking a similar set of questions: Is

there another science lab in the region with quality specifications? Is there a room prepared for that? Do students and school need a science lab? Is the cost of the science lab commensurate with the cost of building the project? Will the Ministry of Education be approved to adopt the project? And other details of the details related to the topic.

● **Sixth Step:**

Through the previous questions, a primary area of suspicion related to the value that is supposed to be achieved and fully developed, is selected, and then moved to another area of suspicion related to the same value, until all areas of suspicion are completed, meaning that each question is addressed and refuted into small parts to answer (fragmentation). fragmented to the maximum), for example, if there is a robot lab in another school, can the school compete with it? What educational materials will the robot application provide to present it as something special? Is it possible to find an academic staff to teach students for this?

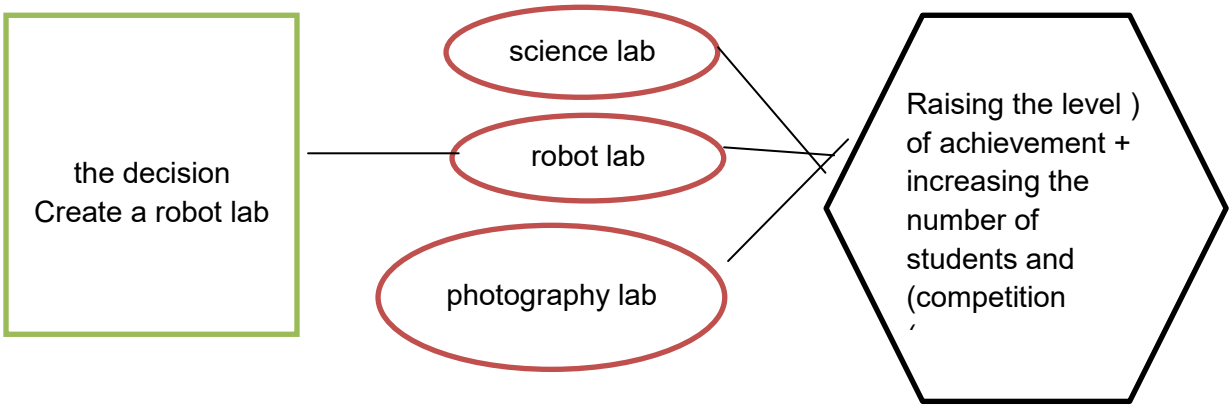
And other questions, each of which separates the above. After completing the details of everything related to the area of suspicion that was chosen, it will move to another area of suspicion until all of them are completed, whether those related to the science lab or the robot.

● **Seventh step:**

The doubts that were developed in the previous step are reviewed, keeping the important ones and deleting the rest, to prioritize work and to prevent distraction and wasting time and effort in resolving doubts that are not important, for example, in the case of a competing school, this reduces the chances of success of the robot project? In the event that the school needs to establish a room for specialized laboratories, this leads to an increase in the cost of its establishment, and in the event that the Ministry of Education does not agree to adopt the project, what are the options for that? , which will affect the financial return and threaten its failure. In this case, the uncertainties that will affect the viability of this option are preserved, and those that are found to be insignificant are removed. The same is done for the science lab option. If it appears from the analysis that one of the two options can succeed without the other, the result is presented to the project owner/decision maker for adoption as a decision, and thus to the next step of calculating the expected material value through the decision tree. The results of the two options converge: the robot and science lab. The issue is also presented to the decision maker to recommend experts and specialists to move to the analysis of both options with the aim of calculating the expected material value for each of them through two separate decision trees (one for each option), through which the material return (expected profit) is calculated.) for each of them separately. Assuming that the results of the previous effect diagram showed that there is one better option than the other, and this option was the robot lab, the decision would be to monitor

cost to create it. Here comes the role of the decision tree in determining the expected value of establishing a robot lab according to new areas of uncertainty related to the adopted decision.

Figure (1) The result we got from the effect diagram



2 - Building a decision tree, to show the best financial value of a decision to set up a robot lab:

The first step

Based on the impact diagram, as in Figure (1), the decision to establish a robot lab is determined, and then through experts and educational specialists, the main areas of uncertainty related to the decision are identified. According to the experts, a major area of suspicion was identified regarding the specialty of setting up a robot lab, and the options were a science lab or a robot lab. A sub-area of suspicion was also identified regarding the possibility of establishing a laboratory, and the options were by calculating the extent of the cost, and the percentage of increase in collection.

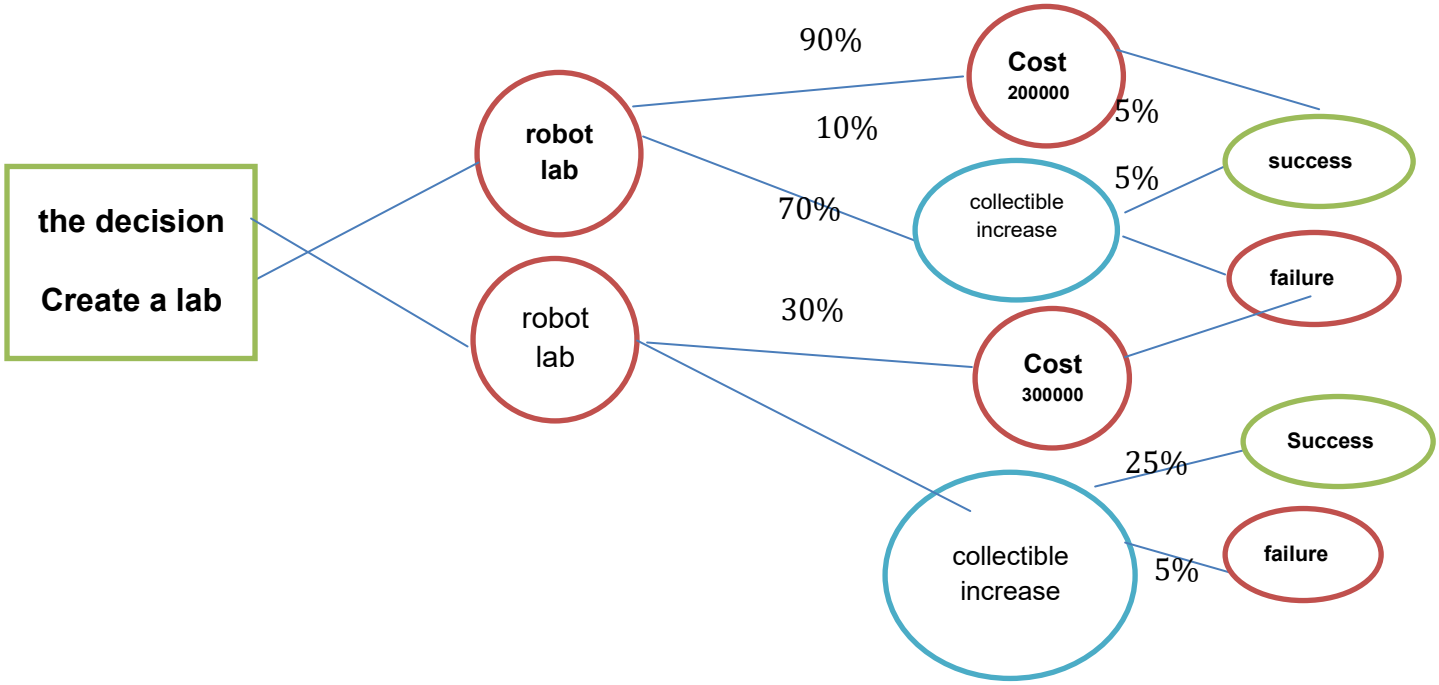
The second step

A structure for the decision tree is built, through which the chronological order of decisions is determined according to their sequence, the areas of suspicion in them, and the branches emanating from them. According to the decision to establish a laboratory to be placed in a box to the left of the paper, followed by two areas of uncertainty related to each of them (a science lab or a robot laboratory), (they are placed within circles / contracts of uncertainty), and each main area of uncertainty is followed by two sub-area of uncertainty related to each of them (the cost and percentage of increase achievement), also (they are placed inside circles).

The third step

The tree was built complete with all the branches emanating from it (options and alternatives) and it was as follows:

Figure (2) Decision Tree Model for Laboratory Construction



Fourth step: Through experts, the following points were determined
The probability of a science lab increasing student achievement is 5%, and the probability of a robot lab increasing student achievement is 25%.
The cost of establishing a science lab is estimated at 200,000 shekels, while the cost of setting up a robot lab is estimated at 300,000 shekels
The percentage increase in the achievement of students achieved during the first year of the science laboratory, if it was established in the school, is estimated at about (5%).
The percentage increase in achievement for students achieved during the first year of the robot lab, if it was established in the school, is estimated at about (25%).
These possibilities, the cost of construction and the value of the expected return are placed above the places allocated to them on the decision tree
Fifth step
The process of reviewing the tree that was built to ensure that all the required data and information, and the main areas of suspicion, and those subordinated to it are present
Sixth step: The solution is according to a mathematical equation through which the total sum of the probability of each output, value or path multiplied by its percentage is calculated, with the need to take into account the mathematical signs (plus and minus). We start with the process of calculating the value of each possibility from left to right in order to make the optimal decision

For the robot lab: the results were as follows
If it was built in school
The cost ratio for the robot lab was 70% with an increase in collection by 30%

For the science lab, the results were as follows
If it was built in school
The science lab cost ratio was 90% with an increase in achievement of 10%
The obtained previous values are placed in their assigned places in the decision tree, and compared between them
Through the comparison, it appears that the higher achievement increase was in favor of the establishment of a robot lab, where the highest percentage was (30%), which is higher than the value of the upper limit for the increase in achievement for students set by the decision maker (the project owner) for profit, which amounted to 300,000 shekels. However, building a science laboratory will give an increase in students' achievement by (10%), and here is the responsibility of making the appropriate decision for the owner of the project.

Ambiguities in the decision tree

Science and Robot Lab: Lack of necessary materials in time
The absence of a qualified and specialized teacher. The absence of a laboratory room.
The administration's lack of commitment and belief in the importance of establishing the laboratory.
Lack of financial liquidity for the project.

The uncertainty in the decision tree.
A robot lab with devices at a cost of 40,000 that simulate normal programs, 60,000 that simulate programs that do teamwork, and 80,000 that simulate intelligence.
Q3: What is the relationship between influence diagrams and decision tree in decision analysis?
Labels close to the decision tree and philosophical logic are also used very close, as they provide impact charts a free service for the decision tree in identifying areas of suspicion and reaching the value to be achieved, whether moral or material, and it is a very powerful tool to show all parties to the problem on one page and show the relationships among each other. Some clarify the decision and its relationship with other decisions and its relationship with competitors. Thus, it is a tool to reduce ambiguity to some extent; The relationships between ambiguity and uncertainty in decision-making are clear
influence schemes deal with complexity and ambiguity; The decision tree deals with uncertainty, and therefore schemas give us the possibility to understand the objectives in a clear and more comprehensive way to remove places of ambiguity and complexity; As the schemes draw the problem, goals, places of ambiguity and complexity, all with the final value, and here in particular the decision tree gives us a trade-off in the schemes according to the direction of the maker and the decision-maker, such as (the price for the commodity and customer satisfaction .. etc.); In the sense that the decision tree is a causal relationship that ends with prices and deals with suspicion only. As for schemas, they deal with ambiguity and complications, and therefore the more ambiguity, the higher the level of suspicion; The common denominator between the decision tree and influence schemes is uncertainty, and from here influence schemes come and draw the logical relationships between all the elements of ambiguity and uncertainty and make the so-called trade-offs in order for the customer to

choose any of these goals in order to achieve them, but the causal relationship in the decision tree is not give us that
Influence charts depict the decision graphically, and thus show us clear relationships related to decision-making. They are all influencing relationships between ambiguity and uncertainty for decision-making and decision-making.
The rectangle indicates a decision.
Circles indicate a doubt
Hexagon indicates values or consequences (outputs)
Risks or difficulties that may face the implementation of the project
Regulatory risk
Sudden change of management and incomplete project
Lack of internal coordination between individuals
Miscalculation of project implementation time
health risks.
A sudden epidemic or disease may disrupt the implementation of the project
financial risk.
A lack of financial liquidity may lead to incomplete realization of the project
political risk.
The occurrence of wars or terrorist acts that negatively affect the implementation of the project.

Feasibility study for establishing a robotic laboratory

Necessary requirements
The required and necessary licenses that are granted to teachers and graduates of the Faculty of Science must be made.
Choosing the right place that is available in an appropriate space.
Providing specialists or graduates from the College of Science, or technicians with a high degree of experience.

Expected costs of the robot lab project

Educational Robot Kit (EV3) ($5000).
Robot Bag (extra parts for Ev3) ($1,000).
A laptop computer with medium specifications and its price (1000 $).
Some other costs such as (desk, chairs, track board for the robot to move..., etc).

Details

The project needs (10) robot bags ($5000 x 10) = $50,000
The project needs (10) additional robot bags ($1,000 x 10) $10,000
The project needs (5) laptops ($1,000 x 5) = $5,000
Total = 50000 + 10000 + 5000 = $650,000
Two sessions per week (each cycle two days per week), two hours per day
Sunday - Tuesday session (1)
Monday - Wednesday session (2)
Each course consists of (5) groups, each group contains (5) students

The duration of one course is two months
12 cycles per year
The cost of the course per student during the two months is $100
Each course consists of (25) students, there are two courses in two months = 50 students in one course for two months
50 students x $100 = $5,000 per session
12 courses x $5,000 = $60,000 premiums annually

operating expenses

The laboratory rent is $1,000 per month = $12,000 annually
Electricity $100 per month = $1,200 per year
Water: $50 per month = $600 per year

Total annual operating expenses

12000 + 1200 + 600 = 13800$
We need (3) teachers for each course
Teacher's hour ($10) two hours each session ($20) each session two days per week (4 hours) = $40 per session
(There are 2 courses per week A + B (8 hours per week) ($80 per week)
The duration of the course is two months 80 x 8 = $640 in the two courses for two months
Three (3) teachers
640 x 3 = $1,920 per session for two months
1920 x 6 = 11,520 $ The salary of the three teachers per year
The project's operational expenses are $13,800, building rent and bills + $1,520, the salary of the three teachers annually = 25.320 $

Annual revenue

60.000 – 25.320 = 34.680 $
The required amount from the funder is $65,000
The project generates profits of $ 34,680 annually
Within two years, the project achieves profits (34,680 x 2) = 69,360
We conclude from the above that the project covers the financed amount within one or two years, and starting from the third year it gives profits.
Note: It is possible to invest the project in private schools by increasing the premiums, and in public schools through extracurricular courses.

Results

The decision tree provides the decision maker with options to present the problem and discover areas of uncertainty, but without reaching a final solution. Therefore, impact charts were used because they are a auxiliary tool, in addition to being a link between team members and the decision-making board, they help people who are unable to clearly understand the objectives.
The role of the decision tree and impact charts in decision analysis This contributes to choosing the best alternatives and the ability to foresight, and to reach the appropriate solution or decision, and this is through the above-mentioned steps.

The decision tree is a causal relationship that ends with prices and deals with suspicion only. As for schemas, they deal with ambiguity and complications, and therefore the more ambiguity, the higher the level of suspicion; The common denominator between the decision tree and influence schemes is uncertainty, and from here influence schemes come and draw the logical relationships between all the elements of ambiguity and uncertainty and make the so-called trade-offs in order for the customer to choose any of these goals in order to achieve them, but the causal relationship in the decision tree is not give us that.

Recommendations

It is very important to use decision analysis models (decision trees, impact charts) for ease of use and dealing with alternatives and reaching the best possible decision.

Decision trees and influence charts complement each other as they work as one spirit in order to make the right, appropriate and quality decision.

Influence charts and decision trees deal with ambiguity and uncertainty, which facilitates the appropriate decision-making process by drawing logical relationships between all the elements for the purpose of foresight.

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