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DESIGNATION OF CLASSROOM SPACE USING LINEAR PROGRAMMING TECHNIQUE

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Abstract

The utilization of Linear programming to take care of the issue of over-designation and under-allotment of the rare study hall space was considered with specific reference to the M. Kumarasamy College of Engineering, Karur. Information was gathered from the College on the study hall offices and the quantity of understudies per program. A linear programming model was figured dependent on the information gathered to expand the utilization of the constrained study hall space. MATLAB was utilized dependent on the simplex calculation to acquire ideal arrangement. Examination of the outcomes demonstrated that six half of the twelve study halls could be utilized to make a most extreme homeroom space of a 1080. It was likewise seen that the administration could utilize 450 surplus spaces to build its understudy's admission from 630 to 1080 understudies, an expansion of about 78% with just half of the all out number of homerooms. Again the board could chop down the quantity of homerooms utilized from twelve to six and decrease the expense of keeping up the study halls by half and still have upwards of six additional study halls for other similarly significant purposes, subsequently amplify its net revenue.

1. Introduction

The problem of assignment of rare asset to fulfill boundless human needs has been and nonstop to be a worldwide marvel standing up to supervisors, directors, business visionaries, heads of organizations and people alike. Space distribution can be characterized as the assignment of assets to regions of

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room, for example, rooms, fulfilling whatever number necessities and limitations as could reasonably be expected. Uvir Bhagirathi [7] created in this research intends to distribute reasonable settings to classes mulling over the separation between the scene and the particular class workforce area just as the size of the setting and the quantity of understudies in the class. In this way, since it is restricted it should in well oversee by the resources towards accessibility and appropriate with the client required. In this investigation, Classroom Space Allocation alludes to the conveyance of the accessible zones of study hall space among various courses with various sizes of understudy populace in order to guarantee the ideal space usage and the fulfillment of extra prerequisites and additionally requirements. In this nonexclusive case, a significant condition exists: the zones of room that can be utilized and the space required by the substances are not exposing to alteration. The perfect arrangement in the space portion issue is one where every one of the substances is distributed, no space is squandered or abused and each extra necessities and requirements have been fulfilled. Gosselin and Truchon [4] introduced a method for assigning homerooms in an instructive organization. It depended on a direct programming model where a punishment capacity is limited. With the default estimations of certain parameters given by the methodology, the model initially allots the same number of genuine rooms to the demands as could be expected under the circumstances. It likewise tries to do as such with the most favored rooms. At long last, when it is important to leave from the most favored rooms to fulfill the primary target, the model endeavors to spread this takeoff consistently among solicitations. By adjusting the default esteems in the punishment work, the client may likewise support a few demands in the attribution of rooms. Limitations are worried about the accessibility of rooms at different long stretches of the day, and with the solicitations for these rooms. They expressed earnestly that since this methodology verifiably investigates every single imaginable task, it should deliver preferred outcomes over manual designation. After effects of experimental applications affirmed these desires, taking the quantity of requests that can be met as the primary model. Also, a mechanized system to set up the issue and decipher its answer has made it conceivable to decline generously the time spent on this undertaking. As per the mission of the M. Kumarasamy College of Engineering, Karur study hall assets are basically for use by understudies, and staff for instructive exercises and projects that

are straightforwardly identified with the elements of educating, explore, and academic creation. Each exertion is constantly made by the College to guarantee that study halls are doled out genuinely, utilized fittingly, and suit the College's scholastic and instructional needs. As indicated by Bougie P. [2], a superior method to reliably and successfully assign study halls is to utilize a PC helped framework that will monitor all homerooms on grounds alongside explicit insights regarding those rooms that can naturally recommend proficient pairings with the courses offered for a given semester. The effectiveness will be made a decision about dependent on numerous components, in particular being that the size of each room is utilized viably.

Oladokun and Badmus [6] learned about relegating various courses to study halls taking into thought limitations like homeroom limits. Asharm [1] expressed that Mathematical programming that takes care of the problem of deciding the ideal designation of constrained assets required to meet a given target, is the direct programming, a technique of apportioning constrained assets to contending needs in the most ideal manner so as to guarantee optimality. Direct programming manages advancement issues where both the target capacity to be improved what not obliges are straight as far as choice factors. A reshuffle problem, the goal is to limit a linear cost capacity. With this goal, it is conceivable to consider the fulfillment of communicated inclinations with respect to showing periods or days of the week or indeed, even homerooms for determined courses. As indicated by Daskalaki S and all [3], linear programming (LP) is a procedure for reshuffle of a linear target work, subject to direct equity and direct disparity imperatives. Casually, linear programming decides the best approach to accomplish the best result, (for example, greatest benefit or most minimal expense) in a given numerical model and given some rundown of necessities spoke to as straight conditions.

The goals of undertaking this investigation on "portion of study hall space by linear programming" at the M. Kumarasamy College of Engineering, Karur are to discover how study hall space is designated to the understudies of the School dependent on the different projects and courses offered by the understudies and to build up a linear programming model to assign study hall space to the understudies in the College dependent on the different projects also, courses offered by the understudies to guarantee ideal utilization of the study halls accessible to the College.

2. Methodology

The information required for the investigation was gathered from the M. Kumarasamy College of Engineering, Karur. A survey was intended to evoke for the required information from the administration of the school on the quantity of study halls the school has and the limits of every one of the homerooms. Additionally data was sort for on the number of projects the school offers and the quantity of understudies selected on every one of the projects. Table 1 delineates the data on study hall offices. Table 2 likewise demonstrates the quantity of understudies per program. The understudies were relegated to the 1080 study hall spaces that were accessible in the fourteen home rooms of various sizes. Toward the start of every scholarly year new understudies are conceded into the school and thus the school must arrangement how to dispense these new understudies and the proceeding with understudies to the accessible homerooms in order to dodge over-distribution and under-designation of the restricted study halls. Inside a period, the occasions homeroom type 1 could be relegated can't surpass four, study hall type 2 can't be allocated multiple occasions, study hall type 3 can't be doled out multiple occasions, study hall type 4 can't be doled out more than two and the room type 5 can't be designated more than once. We along these lines detail the direct programming issue dependent on the above data to amplify the utilization of the constrained homeroom space.

3. Modelling Technique

The study hall space portion issue can be considered as a linear programming problem. The homeroom space was sorted into sorts as per the quantity of seats, and the kind of types of gear accessible. The understudies were put into gatherings named as the classes dependent on the program and the degree of the understudies. Give the limit of every classification (a chance to type) of a study hall be $C_i = C_1, C_2, C_3 \ldots C_n$ for $i = 1, 2, 3 \ldots n$ where

C_1 = the limit of a room of type1

C_2 = the limit of a room of sort 2

C_3 = the limit of a room of sort 3

C_4 = the limit of a room of sort 4

C_5 = the limit of a room of sort five, and so forth.

Give the homerooms a chance to be classified into sorts as $x_1 = x_1, x_2, x_3, \ldots, x_n$ for $i = 1, 2, 3, 4 \ldots n$ dependent on the limits of the rooms, where

X_1 = study hall type 1 with a seating limit C_1

X_2 = homeroom type 2 with a seating limit of C_2

X_3 = study hall type 3 with a seating limit of C_3

X_4 = study hall type 4 with a seating limit of C_4

X_5 = study hall type 5 with a seating limit of C_5

Once more, let the quantity of homerooms of each sort be $a_1, a_2 \ldots a_n$

Where;

a_1 = number of rooms of classroom type 1

a_2 = number of rooms of classroom type 2

a_3 = number of rooms of classrooms type 3 in that order.

Also let the total available classroom space of all the types of classrooms denoted by

$$d = \sum_{i=1}^{n} a_i c_i.$$

The general formulation of the allocation problem is as follows:

The target capacity is $\sum_{i=1}^{n} C_i X_i$.

Subject to constraints $\sum_{i=1}^{n} a_i x_i \leq d \quad (i = 1, 2, \ldots)$.

Since the complete number of understudies that could be appointed to various classes of the rooms cannot surpass the complete homeroom space accessible in every one of the study halls.

Again x_i for $(i = 1, 2, 3\ldots)$ since various understudies to be appointed to a room can't be a negative number.

The target capacity was set up as;

Maximize $Z = 60x_1 + 70x_2 + 80x_3 + 100x_4 + 12.$

Subject to

$$4x_1 + 4x_2 + 3x_3 + 2x_2 + x_5 \leq 14 \; 60x_1 + 70x_2 + 80x_3 + 100x_2 + 120x_5 \leq 1080$$

$$x_1 \leq 4,\ x_2 \leq 4,\ x_3 \leq 3,\ x_4 \leq 2,\ x \leq 1$$

$$x_1,\ x_2,\ x_3,\ x_4 \geq 0$$

Where: x_1 = study hall type 1 with a seating limit of 60

x_2 = study hall type 2 with a seating limit of 70

x_3 = study hall type 3 with a seating limit of 100

x_4 = study hall type 4 with a seating limit of 120

x_5 = study hall type 5 with a seating limit of 150 MATLAB was utilized dependent on the simplex calculation to acquire ideal arrangement.

4. Discussion

Gosselin and Truchon [5] displayed a technique for dispensing study halls in an instructive establishment. It depended on a linear programming model where a punishment capacity is limited. As indicated by Bougie P. [2], a superior method to reliably and viably designate study halls is to utilize a PC helped framework that will monitor all homerooms; the effectiveness will be passed judgment on dependent on numerous elements, in particular being that the size of each room is utilized viably. Once more, Asharm [1] expressed that straight writing computer programs is the Scientific programming that takes care of the issue of deciding the ideal designation of restricted assets required to meet a given target. An improvement problem, the goal is to limit a linear cost capacity. POM-QM for Windows 4 (Software for Quantitative Methods, Production and Operation Management by Howard J. Weiss) with this target, it is conceivable to consider the fulfillment of communicated

inclinations in regards to instructing periods or then again days of the week or even study halls for indicated courses. Investigation of results created from the POM-QM for Windows 4 study Frank Osei Frimpong and Alexandra Owusu [4] Allocation of Classroom Space Using Linear Programming model for windows based on the simplex algorithm.

We consider the problem went through eight emphases before an ideal arrangement was found. Whiles none of the four homerooms of sort 1 with the seating limits of thirty (60) every we dispensed to a class, one of the three study halls of sort 2 with the limits of fifty (70) every, all the two study halls of sort 3 with the limits of hundred every, all the two rooms of sort 4 with the limits of one hundred and twenty each, and the one study hall of type5 with the limit of one hundred and fifty seats were allotted to the Students. We saw that 7 out of the 14 homerooms were utilized to give a seating limit of 630 to oblige the understudy populace of 450 understudies. The greatest homeroom space (ideal arrangement) of 600 and forty was therefore acquired by:

$$(2 * 60) + (2 * 70) + (1 * 100) + (1 * 120) + (1 * 150) = 630.$$

It was understood that six out of the twelve study halls accessible speaking to half of the homerooms were used to give a space of 600 and forty for the 300 and sixty understudies leaving an excess of 200 and eighty spaces which could be doled out to 200 and eighty extra understudies. There were four (4) study halls of sort 1 with the seating limits of thirty (30) each and two (2) study halls of sort 2 with the limits of fifty (50) every which were not doled out to understudies. There were a aggregate of 200 and twenty accessible study hall spaces that were not doled out to understudies along these lines $(1 * 60) + (2 * 70) + (1 * 100) + (1 * 150) = 450$.

The ramifications of our discoveries are that the administration of the College could utilize the 450 surplus spaces to expand its understudy's admission from 630 to 1080 understudies (about 78%). Again the executives could chop down the quantity of study halls utilized from fourteen to seven what's more, decrease the expense of keeping up the study halls by half and still have upwards of seven additional study halls for other similarly significant purposes, subsequently augment its net revenue.

5. Conclusion

The problem of portion of rare asset to fulfill boundless human needs has been and persistent to be a worldwide marvel going up against chiefs, directors, business people, heads of foundations and people alike. The utilization of linear programming to take care of the issue of over-assignment and under-designation of the rare study hall space was considered with specific reference to M. Kumarasamy College of Engineering, Karur. Information was gathered from the College on the study hall offices and the quantity of understudies per program. A linear programming model was defined dependent on the information gathered to expand the utilization of the constrained homeroom space utilizing MATLAB dependent on the simplex calculation. Investigation of the outcomes demonstrated that seven (half) of the fourteen homerooms could be utilized to make a most extreme study hall space of 1080. It was additionally seen that the administration could utilize the 450 surplus spaces to build its understudy's admission from 630 to 1080 understudies, an expansion of about 78% with just half of the absolute number of study halls. It is obviously obvious from the above rundown that direct writing computer programs is a viable instrument that can be used by directors of Educational Institutions to maintain a strategic distance from over-assignment and under-portion of rare assets, especially study hall space.

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