

Development of LED Illumination Work at a Town Center in Collaboration of Students from Different Fields

Haruka Masumori, Nobuo Mishima, and Tomoyuki Koga

Abstract—Most of town management or community building like machidukuri in Japan are carried out not only by a specialist but by many stakeholders of the various fields. There are recently also events such as lights illuminations in town centers as a part of community building everywhere in Japan. These events have various meanings. They can bring tourists from out of the area, then activate the area. The relations between the area to the town center should be made strong. Therefore, town managements need collaborations not only from architecture or city planning but also from various fields. This paper aims to report one of our trials related to development of a LED illumination work at town center in students' collaboration from deferent fields.

Index Terms—Area event, student instruction, collaboration, town management, LED illuminations.

I. INTRODUCTION

Recently, LED illumination events are often used to activate or revitalize town centers in the world. In case of several events, universities and schools are also involved to design and install illuminations in the places because the event organizers such as local governments want to succeed in the events with participation of citizens. Some of the universities make classes for students to have motivation for their participation to the events. Students from different study fields can also take the classes and collaborate together. As an educational meaning, it is crucial for students who study in different fields to collaborate in an assignment. On the other hand, it is not still obvious how to progress the classes and how to let the students especially from different study field work together in a case of participation in LED illumination events. It is important to clarify processes and to inspect every process particularly at productions of LED illumination. Thus, this study aims to clarify problems and ideas of solutions for participation of students from different fields in each production process of a LED illumination event held at a town center.

There are several researches relevant to this study. Kajitani states that community building which is so-called machidukuri in Japanese needs three functions like information, production, and acceptability [1]. Kidokoro mentions that key points are formation of innovation support networks within walking distance, provision of various types

of work-live units, and promotion of creative atmosphere to make the town centers function as innovation hubs in the regions [2]–[4]. A trial of “a liveliness open space” at a mall in Kagoshima is a good example [5]. In Germany, street cafes directly help creating a lively atmosphere and make a town center attractive [6].

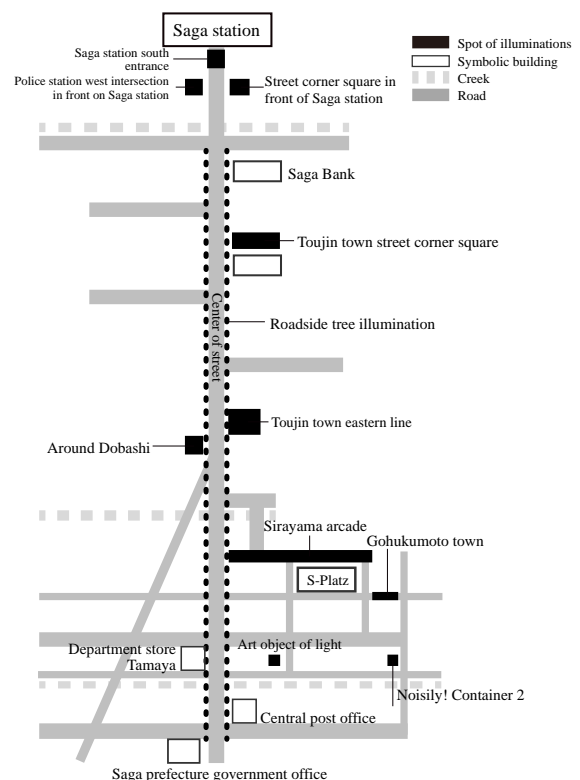


Fig. 1. Map of illuminations of the saga light fantasy.

As a design of illumination, Kuroda *et al.* reports some acquisitions of know-how and technologies in an illumination production [7]. Yoshizawa and Hirate state that workshops on illumination provide occasions for people to recognize the cities [8]. Murkawa mentions that direction of urban space using light is a good chance for students and kids to have interests in the town [9].

As study methodology, Koga *et al.* study that exchanges and experiences will be meaningful educational programs [10]. Imai said that practical knowledge and experience can be utilized not only for temporary light-up but also for lighting design and planning in actual building [11].

Saga University (hereafter, SU) and Nishi Kyushu University (hereafter, NKU) have been collaborating in these couple years to activate Saga prefecture of Saga Light Fantasy (hereafter, SLF) in Japan since 2014. SU and NKU make classes to let students learn group works and problems

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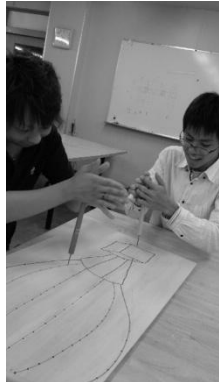
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of town center including the situation of its decline, rules of city such as restrictions in public spaces, know-how to set LED illuminations, etc. As the number of participants is increasing in annually repeating SLF, we make groups to achieve one goal. Considering continuation of collaboration in the LED work, it is necessary to clarify the better coalition of SU, NKU, and operation committee, so we conduct a survey to inspect their preparation of SLF for modeling a collaboration by students from different fields in LED illumination works (hereafter, LED works).

II. METHODOLOGY

A. Study Area

Our study area is a central street of Saga city in Japan (hereafter, S-city) as shown in Fig. 1. The place of spot illuminations is decided by the executive committee of SLF after opinions of executive committee have being adjusted. Most of the LED illumination are placed at the center of S-city to make visitors walk there during the SLF period.



(a) One scene of pre-work. (b) LED decoration of objects.
Fig. 2. Sceneries of pre-works and decorations of LED illumination.



Fig. 3. A completed LED illumination of SLF by SU students.

B. Outline of SLF

The SLF which concept is "I'll love Saga" is annually held in the above-mentioned area since 2000. The term is from the end of October to the beginning of January simultaneously held with Saga Balloon Festival. Approximately 1,800,000 light bulbs of LED color the downtown of S-city. The lighting up starts with disguise parties of Halloween and an opening parade of Saga Balloon Festival on October 28.

C. Production of LED Spot Illumination by Students

Students of SU studying architecture and civil engineering and students of NKU studying welfare are participating in SLF every year. SU students take classes of special lectures of civil engineering and architecture (reactivation project of downtown, I and II), and NKU students take a class of volunteer named Asunaro. Although the collaboration was conducted also in 2014, this study use the data of the 2015 fiscal year. The students pre-worked for preparation of LED work from June to September, e.g., designing installations using LED, making holes on plywoods, coloring a character of Saga, and installed the illumination works in October as shown in Fig. 2. A completed LED work is shown in Fig. 3.

D. Study Methodology

First, all events in the production are extracted after arranging the purpose of LED works, targets, schedule, the composition of the students, and scenes of their works. Second, a questionnaire survey is conducted to analyze the abstracted events more deeply. The questionees are the students mentioned above. Then, effects, problems, and issues to be considered in every stage are discussed.

In the questionnaire survey, problems they felt in every process and degree of satisfaction were questioned. Number of questionees were 75 students, valid response was 51, and rate of valid response was 68 % (see Table I).

TABLE I: THE OUTLINE OF A QUESTIONNAIRE RESPONDENT

| | Attribute | Number of participants (person) | Answer (person) | Valid answer (%) |
|----------------------------|-----------------------------|---------------------------------|-----------------|------------------|
| Grade | 2 nd grander | 28 | 27 | 96.4 |
| | 3 rd grander | 43 | 20 | 46.5 |
| | Teaching Assistant | 4 | 4 | 100.0 |
| Gender | Men | 57 | 34 | 59.6 |
| | Female | 18 | 17 | 94.4 |
| The place of illuminations | Gohukumoto town | 17 | 12 | 70.6 |
| | Around Dobashi | 19 | 12 | 63.2 |
| | Street corner square | 21 | 16 | 76.2 |
| | Saga station south entrance | 18 | 11 | 61.1 |
| | Total | 75 | 51 | 68.0 |

E. Contents and Problems of Works

Contents and problem of the 2015 fiscal year's activity is as shown in Table II. The flow, category and contents of works performed by SU and NKU students, staff of S-city, and SLF executive committee are arranged. Main problems occurred on each day are abstracted by observation.

III. DESIGN PLAN OF ILLUMINATION WORK

The students participated in SLF were grouped into four groups of the Dobashi area, the Gofukumoto town area, the street corner square near Saga station, and the south square of Saga. Each group was subdivided into four sub-groups of four to five students. Fig. 4 shows an example of the study

designed by the group of the south entrance square of Saga station.

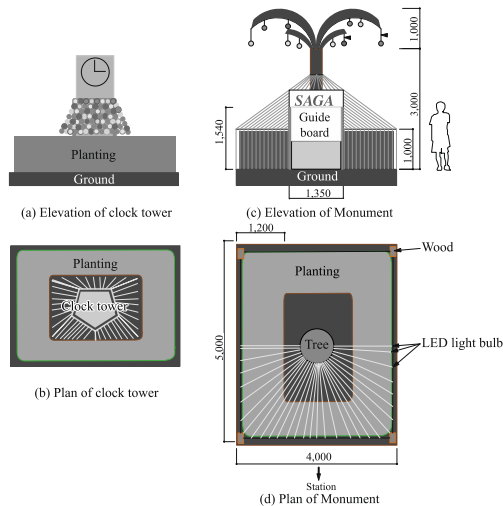


Fig. 4. A design idea at Saga station south entrance.

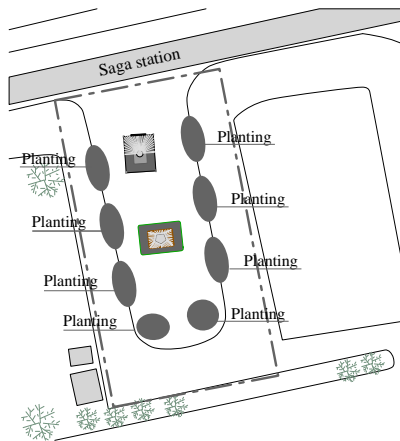


Fig. 5. A design schematic in a target place.

Fig. 5 shows a schematic plan of the south entrance square designed by students. The south entrance square of Saga station is composed of low trees, high trees, and a clock tower. In case of the clock tower, students made wooden frames and set LED lines with color balls slantingly on them. It is a design gives cheerful atmosphere to the front side of Saga station as a symbol of Saga. High palm tree was also set by LED lines with color balls up to its upper part. There is a sign “SAGA” decorated with LED which can be seen at the entrance of Saga station.

IV. THE QUESTIONNAIRE SURVEY








A. Production Process

The production process of LED works could be classified into four steps. Namely, the four steps were to prepare preliminarily, to make design idea and plan, to modify the design, and to work at the site, respectively. Considering the processes, we conducted a questionnaire survey on students' feelings.

B. Contents of Questionnaire

Contents of the questionnaire were as follows: attributes, design of illuminations, number of participation times, feelings on revitalization in the center of town, impression on each process, and feelings to events which have happened besides the above-mentioned fact. We used multi-selection for questionees to answer easily or blank space for questionees to answer freely.

TABLE II: CONTENTS AND PROBLEM OF STUDENTS' ACTIVITY IN THE 2015 FISCAL YEAR

| Month | June | | July | | August |
|-----------------|---|---|--|--|---|
| Day | 12th | 16th | 1st | 12th | 7th |
| Details of work | Discussion about the previous fiscal year and cooperation between SU and NKU. | Student orientation was performed. The plan of class was explained and the previous fiscal year's case was shown. | An Explanation of town center by Prof. Mishima and staff of S-city was done. An inspection was also carried out. | A field survey of the target place was conducted. A design plan was contrived. | The design ideas contrived on July 12 were submitted. Then the design ideas were checked by Prof. Mishima, and problems were discussed and corrected. |
| | | |  |  | |
| Problem | Although most of the problems were solved as a pre-discussion, it was still difficult to have a consensus. | As it was before registration of class, number of participants was not decided yet. | Although most of the students could understand the situation of town center well and enjoyed the inspection, some students were absent from the lecture. | There was no space enough for the student to work. Most of the students could not imagine how to make illumination, so a real LED was shown by staffs of S-city. | There were few groups which could finish the planning until the checking of design ideas. Some of the ideas were too careless to realize. |
| Month | September | October | | | |
| Day | 30th | 9th | 10th | 11th | 29th |
| Details of work | The ideas of design were discussed over again. After that, procedures of making the LED illumination were planned in each group.  | Group leaders confirmed the design plans and the procedures also on October 10 and October 11 with staffs of S-city.  | LED illuminations and objects planned were installed in a target place by students.  | LED illuminations and objects planned were installed in a target place by students.  | 2015 SLF opening ceremony.  |
| | | | | | |
| Problem | It was difficult to measure the sizes of several pieces of furniture and objects in target places. Therefore, rough plans of the places and objects were sketched and the sizes were estimated. | The operation procedures of some design ideas were not decided clearly. Therefore, some requests from S-city such as needed materials were not satisfied. | There was a group whose work had not been finished. | There was a group who did not make waterproof of LED. Therefore, some of the illuminations had been short-circuited because of the previous day's rain. | As the time was too short to disguise because of a regular class, some students came to the meeting place barely before the opening time of the parade. |

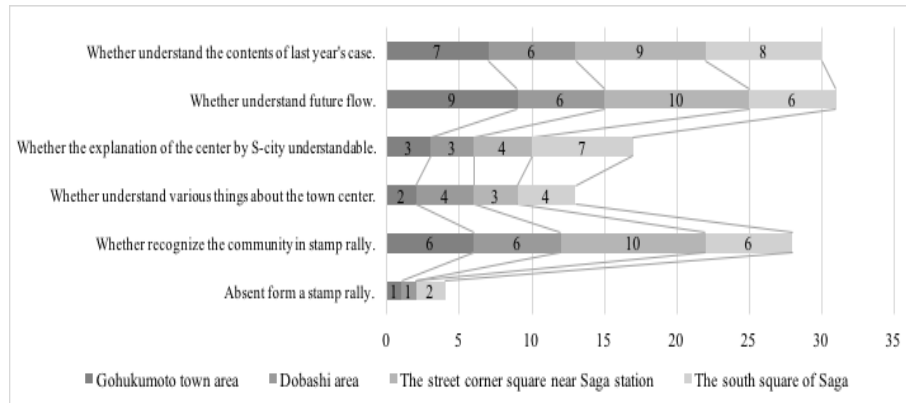


Fig. 6. A result of questionnaire on the first step.

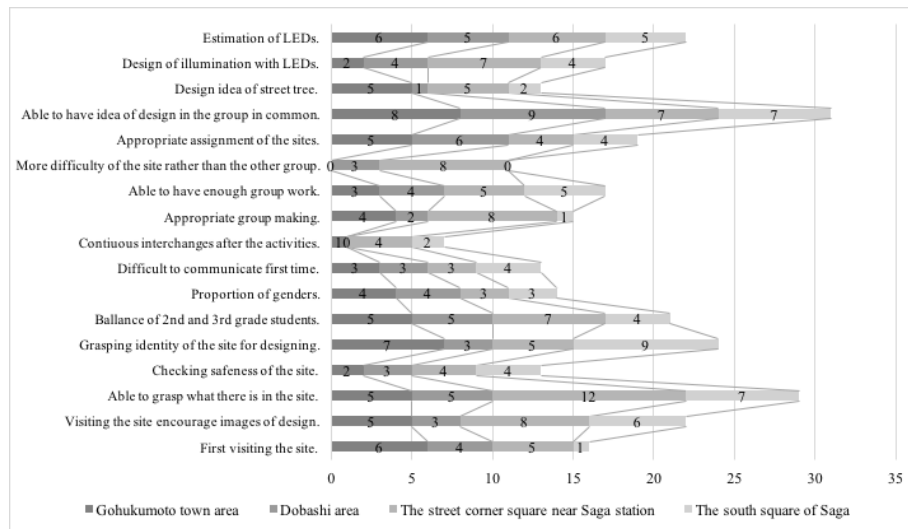


Fig. 7. A result of the questionnaire on the second step.

V. THE IMPROVEMENT POINTS JUDGED FROM RESULTS OF THE QUESTIONNAIRE SURVEY

A. Aim and Method of the Chapter

This chapter aims to make clear the points of improvement of the LED illumination works. To analyze the points, the understanding issues are questioned in each step, and impression and opinions of students in the steps are extracted.

B. Results of the First Step

In the first step, preliminary work like preparation was done. Namely, the preliminary works were, e.g., an orientation of the class, a lecture in the town center on July 1 and a walk in the town center on June 16 (see Fig. 6).

We could find three points to improve the first step in the future from the questionnaire survey as followings:

- (1) To have more explanations for making the class more substantial because introduction of enterprises' activities in the town and explanation on surroundings of the target place were very useful for students.
- (2) To request cooperation to residents in the town center when we implement an event of stamp rally. To prepare a map indicates the accurate way to students. It is not only for indicating the route but for showing the places of stamp rally.
- (3) To show examples of the last year's LED works for students.

C. Results of the Second Step

The second step was to make idea of design and plan. The works the students had done were to make confirmation of the site on July 12, and to discuss planning of LED works (see Fig. 7).

We could find five points to improve the step 2 in the future as followings:

- 1) To show the last year's works because design of LED works is seriously influenced by the place, although the target place of this time was appropriate.
- 2) To design illumination with LED practically.
- 3) To make main concept for design. Roadside trees should be designed.
- 4) To be let participants more actively discuss LED works under the instruction of teaching assistants (hereafter, TA).
- 5) To make time for extra co-works of students because there are difficulties to find more time in normal classes.

D. Results of the Third Step

The third step was modification of design considering reality such as the site conditions. They submitted their ideas of design on August 7, modified the design on September 30, and leaders discussed on October 9 (Fig. 8).

We could find six improvement points as followings:

- 1) To buy materials before the students work. They went to buy on the day. Therefore, it was difficult to complete.

- 2) To list up materials in designing step. As materials were not decided, the setting of LED was competed after the sunset.
- 3) To design freely without considering the cost.
- 4) To make leaders meeting times in the processes.
- 5) To let students plan how to fix LED works to the ground in the designing process.
- 6) To let TA grasp students' activity and report to teachers.

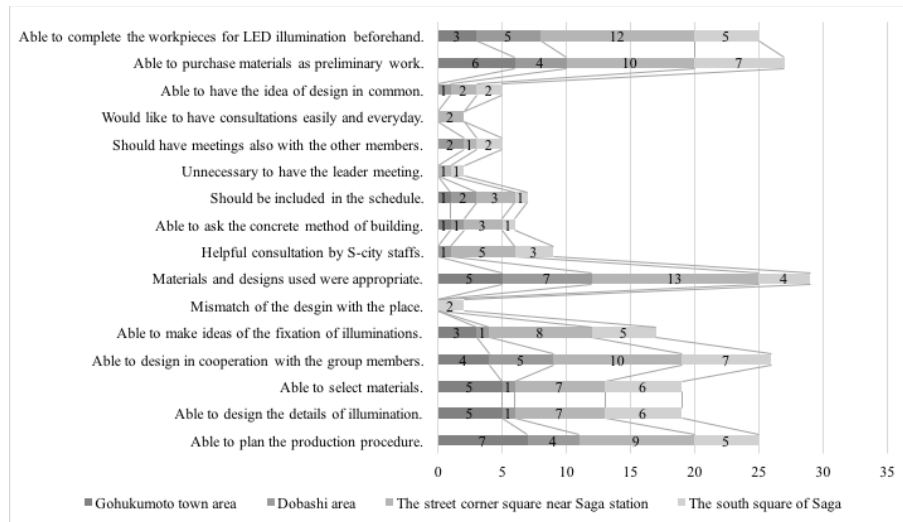


Fig. 8. A result of the questionnaire on the third step.

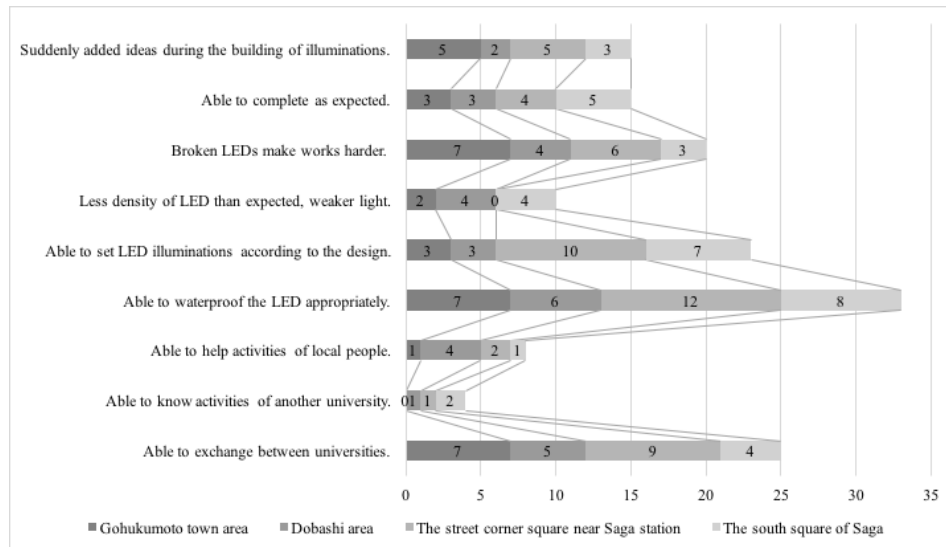


Fig. 9. A result of the questionnaire on the forth step

E. Results of the Forth Step

The forth step consists of works of making LED works. On October 10 and 11, the students brought things they made for illuminations to the site, decorated parapets of a bridge, bus stops, trees and monuments with LED and they made or bought ornaments (Fig. 9).

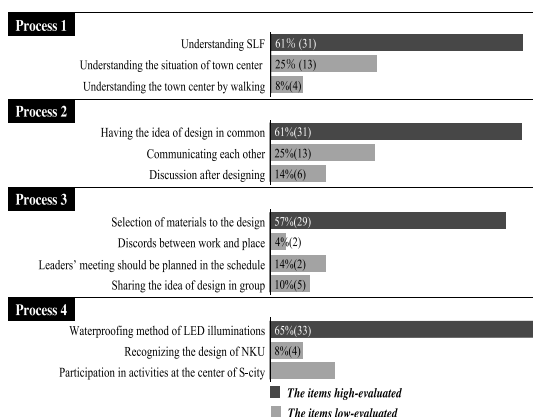


Fig. 10. Impression and opinions of the students.

Here, we indicate five points to improve in the future.

- 1) To be use much more LEDs for bettering illumination.
- 2) To let NKU students co-work together with SU students in the design process. When making groups, their name should be listed together.
- 3) To let the students know in the class that some communities in the town were calling for participation in SLF decoration in their Facebooks.
- 4) To confirm feasibility of students' ideas in the latter process.
- 5) To prepare much more generators at the sites.

F. Evaluation by Students

Some problems were extracted from the results of the questionnaire survey. Fig. 10 shows items with evaluations. The items with the highest evaluation students gave in the four process were from the first process to the process forth as followings: understanding SLF (61%), designing together (61%), selecting materials for design (57%), and waterproofing LED illumination (65%), respectively. The

items with the lowest evaluation were from the first process to the forth process as followings: understanding the situation of town center (25%), communication with each other (25%), and interchanging with the other people of SLF (14%), sharing ideas to corrected design (10%), and participation in the activation of the town center of S-city (16%), respectively.

These results show that there were SU who did not know about the class “Asunaro” of NKU in particular. Although it is important to know each other for NKU and SU students to do something together, they had no time to discuss. The executive side needs to consider their situation especially in the production processes of LED illumination.

| | Design-oriented student (DoSt) | Volunteer-oriented student (VoSt) | Event manager of city (EM) |
|-----------|--|--|----------------------------|
| Process 1 | Preliminary preparations (TA and EM → DoSt) | | |
| | June Guidance of class <ul style="list-style-type: none">• Introduction of some examples. (Distribution of handouts)• Registration. | Announcement of opening the class. Guidance of the class and its registration. At the moment, most of students do not know the town center. | |
| | July Lecture and inspection in the downtown of S-city <ul style="list-style-type: none">• Explanation on the revitalization projects in the downtown of S-city. (A staff of the S-city authority introduces the projects and activities in the downtown)• Inspection in the town. (Some of the spots of projects are shown and explained) | | |
| Process 2 | Design plan (TA → DoSt/VoSt) | | |
| | July Confirmation of places, and study of design plan <ul style="list-style-type: none">• Group making. Two or three target places are prepared. (TAs and all the students are grouped.)• Field survey and discussion on design concept. (TAs play a role as leaders. A real thing of LED is shown.)• Surveys of the target places. (Standard establishment of place where a structure is manufactured)• Guidance of overtime activities. (Coordination of schedule) | EMs guide students to the target spots. Last year EMs did not show any conditions. Yet, it brought big problems. | |
| | July Workshop <ul style="list-style-type: none">• Advices to the plans.• Guidances of decoration of roadside trees. | | |
| Process 3 | Correction of the design (DoSt→TAs assist the correction in detail) | | |
| | August Submission of design plans <ul style="list-style-type: none">• Correction and Advice. (Considering whether it is possible to set the illuminations in safe) | TAs and EMs support students to complete LED illuminations. Their group works are performed. | |
| | September Correction of design plans <ul style="list-style-type: none">• Correction of the design plans by the groups.• Estimation of LED illuminations. (Including fixation methods of LED illumination)• Making plan of procedure. (Selection of materials, and estimation of cost)• Preliminary preparations. (Purchase of materials, and making directions) | | |
| Process 4 | October Leader meeting <ul style="list-style-type: none">• Sharing of design ideas and method of LED illuminations between SU and S-city.• Consultation of a plan in detail of decoration. | | |
| | Field work (Design /VoSt coming into action as leaders) | | |
| | October Setting work of LED illuminations on the 1st day <ul style="list-style-type: none">• Design plans are arranged at the site. | October Setting work of LED illuminations for the 2nd days <ul style="list-style-type: none">• Arrangements of a generator | |
| Process 4 | October Setting work of LED illuminations on the 2nd day <ul style="list-style-type: none">• Design plans are arranged at the site. | | |
| | October The decoration of downtown by residents (Student can participate as they like) | | |
| | October SLF opening parade <ul style="list-style-type: none">• SLF Lighting ceremony. | SU and NKU students gather and participate in the parade together. | |
| | January Removal LED illuminations of SLF | | |

Fig. 11. A proposal of production process for LED illumination collaboration of SLF.

VI. ISSUES AND PROPOSALS OF THE PRODUCTION PROCESS

Through the analyses of SLF on its process and students' perception, we found that important role of SLF were played by design oriented student (hereafter DoSt), volunteer oriented student (hereafter VoSt), and executive committee of event management (hereafter EM). Above all, DoSt especially played a leading role of this activity and was positioned as a key player in the step of designing LED decorations. Meanwhile, VoSt tended to collapse when they collaborated to design with DoSt because their special field was not devising design. It showed that VoSt were participating in SLF like an assistant of DoSt. We can suggest that it is necessary to build a process in which DoSt play a role as main body with assistance by VoSt, and both of DoSt and VoSt should be evaluated. Fig. 11 shows a proposal of production process for LED illumination collaboration of SLF considering the above-mentioned problems.

VII. CONCLUSION

First, A LED illumination work for SLF was conducted as a university education. The LED work was examined by questionnaire. As results, the processes were reviewed and an improved production process could be proposed.

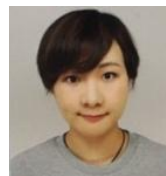
Second, the most of the students participated in this SLF could experience good exercises on LED setting and town revitalization viewing from their satisfaction shown in the results of the questionnaire. On the other hand, the students were involved not only in SLF but also in the other projects of Saga city without their wills. Therefore, it is necessary that the teaching side manages students' activities considering both capacities of students and requests from the other organizations.

The process we proposed has also limitations caused from one. It is necessary furthermore to solve problems.

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He worked at Eto Shintchi Architecture Atelier in Vienna and in Osaka, Japan, as a Technical Staff from 1992 to 1994. Since he was graduated from the doctor course of University of Tokyo, he has been with Saga University, Japan, as Lecturer from 1995 to 1998, Assistant Professor from 1998 to 2007, Associate Professor 2007 to 2013, and Professor from 2013. Moreover, he got the Qualified Architect of First-class in Japan on February 7 of 1997. Prof. Dr. Arch. Mishima belongs to Arch. Inst. of Japan (AIJ), The City Planning Inst. of Japan (CPIJ), Assoc. of Urban Housing Sci. (AUHS), Japan Inst. of Archt. (JIA), Saga Archt. Assoc. (SAA), Int. Assoc. of Lowland Technology (IALT), and Korea Contents Assoc. (KoCon). His main research interests include urban planning and design, and architectural design. He has many awards from several institutions, such as two Achievement Award by AUHS in 2010 and 2012, Best Presentation Award of the Int. Conf. of journal papers and proceedings paper of conferences.