

# Newcomers in Japanese Laboratory under COVID-19 Conditions: From the perspective of internationalization of science laboratory

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## Background

Laboratory instruction at Japanese universities is highly closed, overly dependent on individual teachers, and lacks transparency and flexibility as an educational system (Saito, 2018). It is not responsive to students' needs.

The biggest reason for international students to drop out is not submitting a dissertation 20% of the time (Ito et al., 1999), and their biggest concern is not knowing how to do research (Tsuchida et al., 2004). The solution to this problem cannot be handled by institutions or people outside the laboratory because of the specialized content related to the research.

However, higher education research is dominated by policy and other macro research, and there is virtually no micro qualitative research on university laboratory instruction at home or abroad (Yukawa et al., 2019). This situation is in contrast to elementary and secondary education, which has developed methodologies and teacher training systems based on a vast accumulation of research.

To improve the science laboratory, laboratories need to prepare options for diverse students (Koizumi, 2021). Newcomers whose factors necessary for research achievement are inhibited by COVID-19 must acquire them in ways other than the ones they have used so far. The method of acquisition is a new option and a clue to community improvement.

**Table 1: Participants in each year**

	Nationality	2018	2021	2022
Associate Professor	Japan	1	1	1
International Students	Indonesia	0	1	1
	China	2	2	1
Domestic Students	Japan	7	6	8
Total number of people		10	10	11

## Aim and Research Questions

The purpose of this study is to obtain suggestions for the internationalization of laboratories from the methods of research accomplishment of newcomers in the science laboratory community under the COVID-19 situation.

There are two issues to be addressed.

1. **What factors are necessary for research achievement?**
2. **How did the newcomers (3rd year undergraduates) who started participating in the science laboratory community after COVID-19 occurred accomplish their research?**

## Participants & Method

We conducted a qualitative analysis of field-based research data (interviews and field notes) collected from all members (Table 1) of a science laboratory at a local national university in a prefecture with the most stringent COVID-19 measures in Japan. Among them, three were newcomers who started belonging to the laboratory in September 2020 and graduated in March 2022.

## Results

### Issue (1)

#### What factors are necessary for research achievement?

- Three factors were found to be necessary for research achievement: (1) learning through spatial sharing, (2) learning through relationships, and (3) access to artifacts: experimental equipment.
- The order of acquisition of the three factors was (1), (2), and (3).
- (3) Access to experimental equipment is necessary for the achievement of research, but COVID-19 caused newcomers to be spatially isolated and prevented them from learning from (1), thus preventing them from learning from (2) senior students.

### Issue (2)

#### How did newcomers who began the science laboratory community participation after the COVID-19 outbreak accomplish their research?

- The newcomers achieved (3) through one-on-one tutoring by their supervisor. It kept the faculty advisor busy. In addition, newcomers' learning through collaboration, including discussions with other members of the community, was impaired.

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## Conclusions

There is an urgent need for organized support to meet the needs of students and to improve the busy schedules of supervisor. For example, the department could assign staff to create videos of experimental equipment in use and make them available on demand. This method means that students can watch the scenes of equipment use many times and have more options for learning. In addition, by having underclassmen present when faculty advisors teach upperclassmen on the same research topic, the three factors can be accomplished within a small community. These methods would simultaneously allow for a reduction in faculty busyness.

These remedial measures will not create a benefit to anyone within the laboratory community to the detriment of anyone else. They are effective methods for all members.

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