

Influence of Culture on Hazard Identification in Undergraduate Chemical Engineering

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This paper studied on the different cultural backgrounds on KTY for junior year students of chemical engineering department of Fukuoka University (FU), Japan and King Mongkut's Institute of Technology Ladkrabang (KMILT), Thailand. Both the individual answers were the most influential to KYT final examination than the group discussion answer or the neither individual nor group discussion answer. The individual answer of FU are 52.5% and 49.4% of KMILT, respectively. Furthermore, there were some opinions in "case study no. 2: *he cuts the vinyl rope by using box-cutter knife for unpack the cardboard*", "case study no. 4: *he put office shelf (90kg) on the dolly with female employee*", and "case study no.7: *he loads the heavy bags to a dolly*" which observed only FU students. Finally, during being in-group discussion, the role of secretary and commentator be influential on the KTY final examination than leader, presentation and reporter.

1. Introduction

This paper reveals the different cultural backgrounds on hazard identification methods as hazard prediction training (Kiken Yochi Training: KTY) for junior year of undergraduate students of chemical engineering department of Fukuoka University (FU), Japan and King Mongkut's Institute of Technology Ladkrabang (KMILT), Thailand. KTY was conducted at two universities, as part of a lecture. The KTY method increases the motivation of workers to practice in teams (Ministry of Health, Labour and Welfare, 2018). It uses meetings to sharpen awareness of what constitutes danger. Workers share information on hazards and improve their problem solving capabilities by working on finding solutions in meetings. In addition, they improve their powers of concentration by practicing pointing and calling activities in all of the important points in the work.

In the KTY class, the illustrations of the workplace/laboratory room and work conditions were used, The students discuss each other in small group about hazardous factors in the workplace and in work conditions (unsafe conditions and unsafe behaviour that may lead to accidents.). The influence of different cultural backgrounds on the discuss, think about, and understand type of accidents were investigated. The hazard prediction training based on the KYT Basic 4-Round Method as (Zero accident promotion department of Japan International Center for Occupational Safety and Health, 2018)

Round 1: What are the hidden hazards? (Understanding the actual situation)

Round 2: These are the danger points. (Investigating the reality)

Round 3: What would you do? (Establishing countermeasures)

Round 4: These are the danger points. (Setting targets)

Following (i) to (iv) are the procedure of KTY in the class.

Each student get the workplace/laboratory room and work conditions illustration then they were asked to consider the hazard factors of that illustration. (ii) Making group and discussion for opinion exchange. (iii) Each group present their hazard factor consideration to the class. (iv) As final exam, student consider hazard and it emergency plan of each case in yourself, once again.

Table 1: KYT class information

Hazard identification		Kiken Yochi Training (KYT)	
Subjects	Fukuoka University (FU), Japan	King Mongkut's Institute of Technology Ladkrabang (KMITL), Thailand	
	Junior year of undergraduate student		
Time	90 minutes		
Class	50 students /class	30 students /class	
Team	4-6 students /team		
Contributor	2 persons / team		

Table 2: Cases study in the class

Case no.	Detail
1	He makes dilute sulfuric acid by adding sulfuric acid to water.
2	He cuts the vinyl rope by using box-cutter knife for unpack the cardboard.
3	A woman is wiping window blinds.
4	He put office shelf (90kg) on the dolly with female employee.
5	He move cardboards from top to floor.
6	He is going down from the 2nd floor with a broom and a filled water bucket.
7	He loads the heavy bags to a dolly.
8	She washes dishes in kitchen while boiling the water.

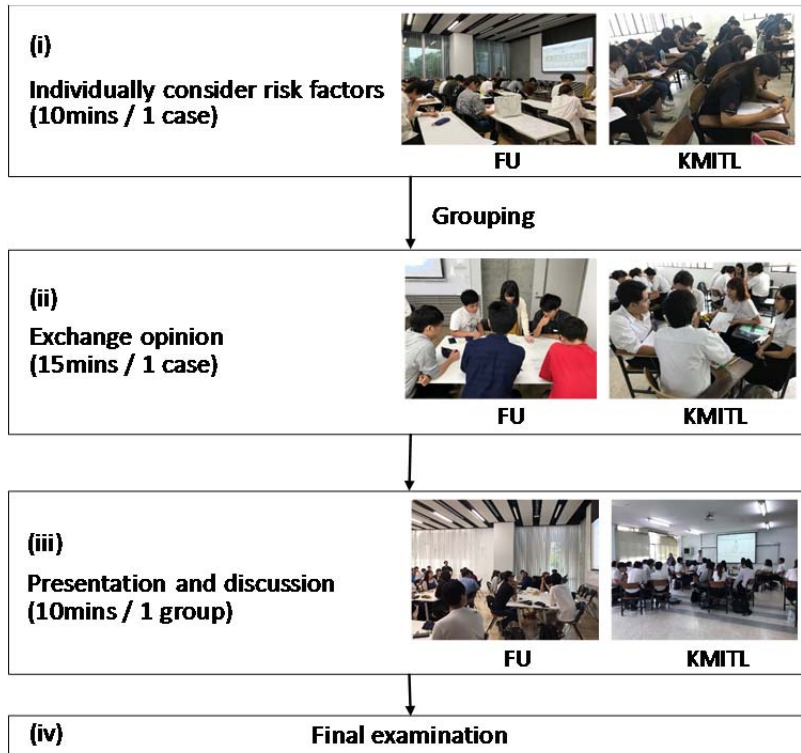


Figure 1: Flow of course, content sequence and class atmosphere of junior student at FU and KMITL

2. Result And Discussion

Overview of the KYT final examination results of both junior students are showed as figure 2. The results were categorized as

- (a) Individual answer which the student still remained his thought
- (b) Group answer which the student accepted his group's discussion and changed his thought
- (c) Neither individual nor group answer that the student may accepted other groups' discussion and changed his thought.

Figure 2(a) shows overview of the junior students of chemical engineering department of FU. The results shows that the ratio of final examination are 52.5% of individual answer, 23.7% of group answer and 22.2% neither individual nor group answer, respectively. While, in case of the final examination of junior students of KMITL, the results are 49.4% of Individual answer, 39.9% of group answer and 6.5% neither individual nor group answer of the junior students of KMITL. It can be remarkable that the observed KYT final examination results of both institutions were similar. The percentage of both the individual answers were the most influent to final examination than their group answer or the neither individual nor group answer.

However, the proportion of group answer of KMITL final examination results revealed more influent than FU nearby 16.2% while the nether individual nor group answer of FU final examination results revealed more influent than KMITL around 15.7%. Due to the limited time of group discussion that was decided around 10-15 minutes per each KYT case per each group. There were 3-4 students per one group of KMITL but 5-7 students of FU. The smaller group as KMITL, students could spent more time for the discussion in each other than that the large group as FU.

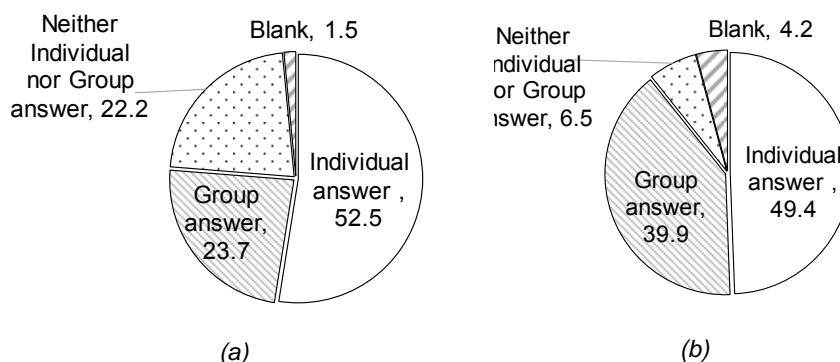


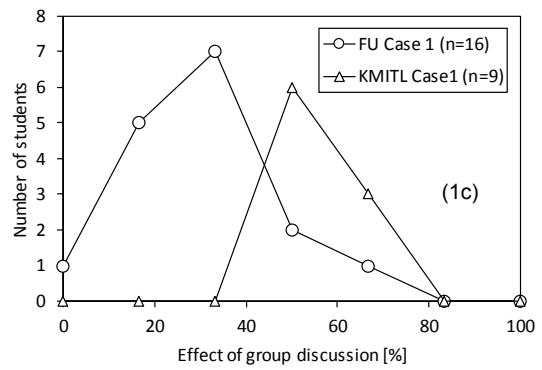
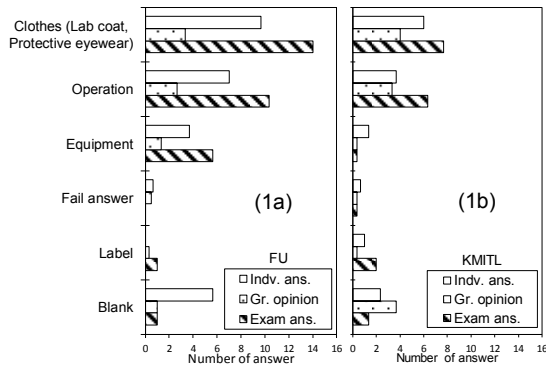
Figure 2: Final test results of (a) FU (n=33) and (b) KMITL (n=28)

Figure 3 (1a to 8a) and (1b to 8b) show the final examination results of individual, group and neither individual nor answer of chemical engineering junior student of FU and KMITL, respectively.

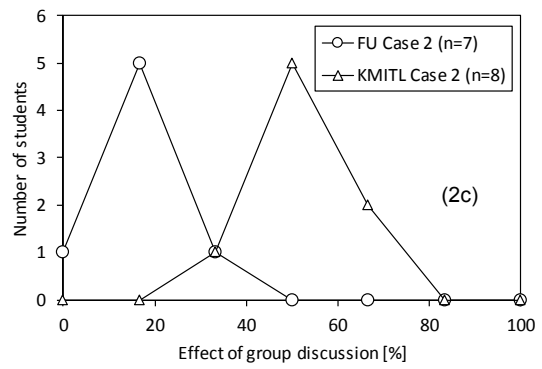
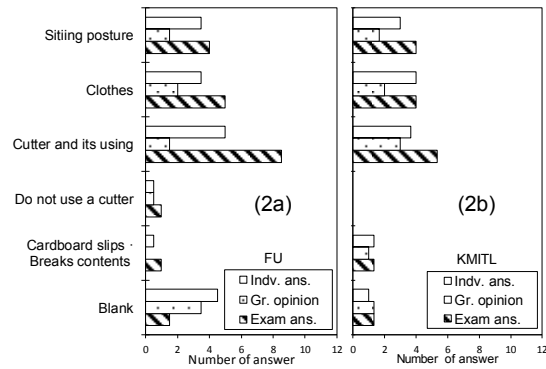
Similar opinion: The results of "case 1: he makes dilute sulfuric acid by adding sulfuric acid to water", "case 3: a woman is wiping window blinds", "case 5: he move cardboards from top to floor", "case 6: he is going down from the 2nd floor with a broom and a filled water bucket" showed both students of FU and KMITL answers similarly. For example, as case 1, sort of cloths and operation were the large ratio of the both students' answers. In can be considered that the different cultural backgrounds were not effect to these cases.

Difference opinion type: However, "case 2: he cuts the vinyl rope by using box-cutter knife for unpack the cardboard", opinion as "Do not use a cutter" and case 4, opinion as "clothes (slippers/gloves)" were observed only FU students. About Case7: he loads the heavy bags to a dolly, opinion of "working alone" FU result was larger than KMITL. On the other hands, opinion of "slip" in KMITL were larger than FU students. Moreover, opinion of "wear long sleeves" was observed only in FU students. Therefore, it could be concluded that these results due to the different cultural background.

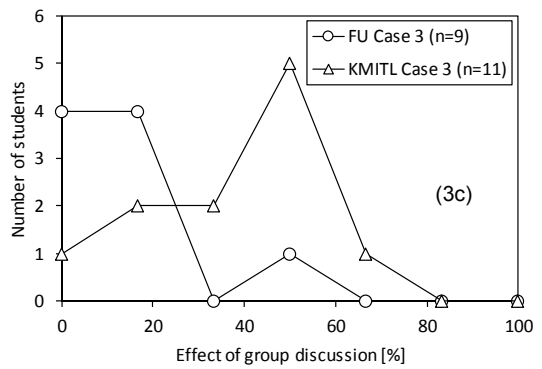
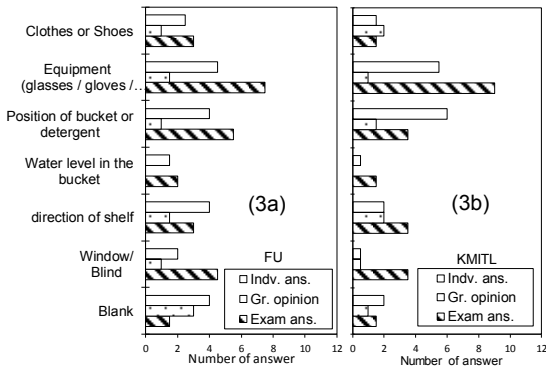
Effect of group discussion: Figure 3 (1c to 8c) reveals effect of group discussion on case 1 to 8 between both students' insitution. The opinion exchanging during the grouping was effect to both students which approximately 25% of FU students and 40% of KMITL students, respectively. However, the most influent of group discussion to the final examination of FU revealed around 33% in "case 6: he is going down from the 2nd floor with a broom and a filled water bucket" while KMITL students reveals around 80% in case 6 and "case 8: she washes dishes in kitchen while boiling the water". Therefore, the effect of goup discussion could be the limited in-group discustion time and numbers of group discussion.



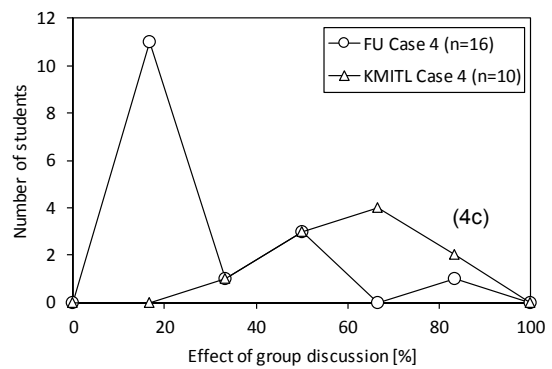
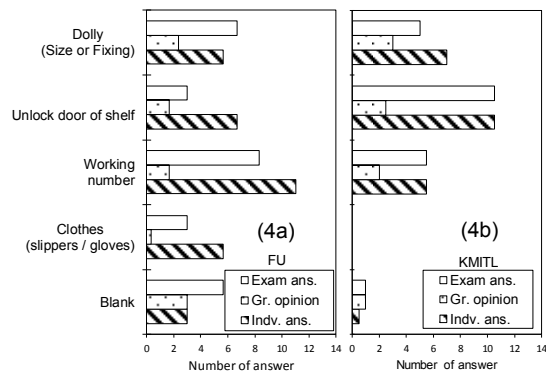
Case 1: He makes dilute sulfuric acid by adding sulfuric acid to water



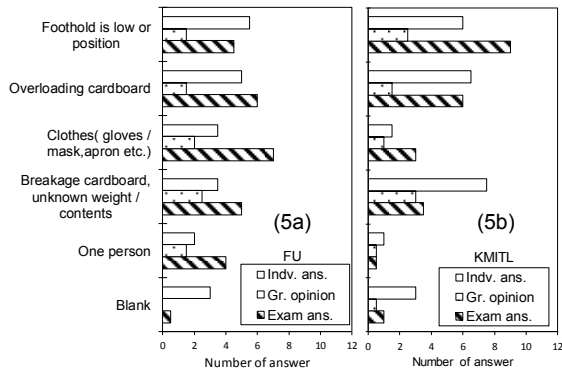
Case 2: He cuts the vinyl rope by using box-cutter knife for unpack the cardboard.



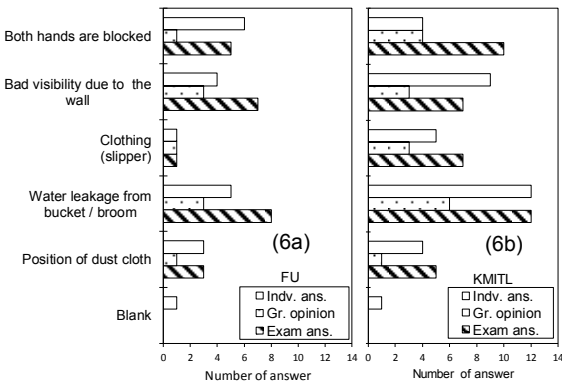
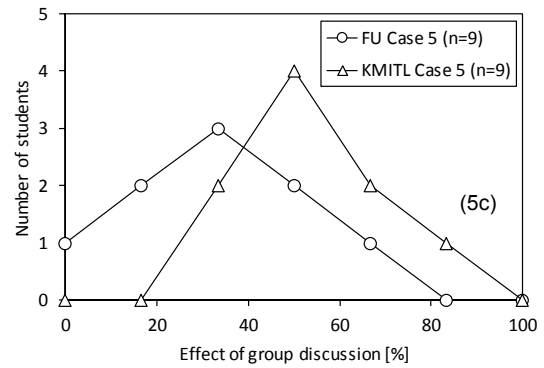
Case 3: A woman is wiping window blinds.



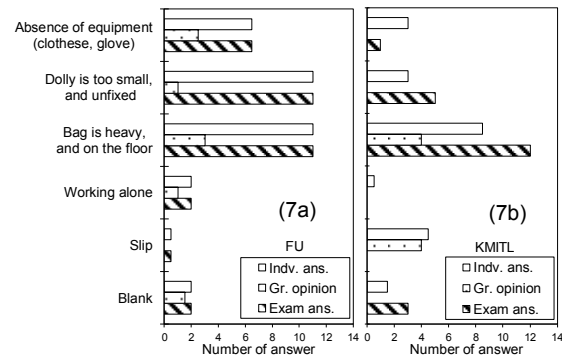
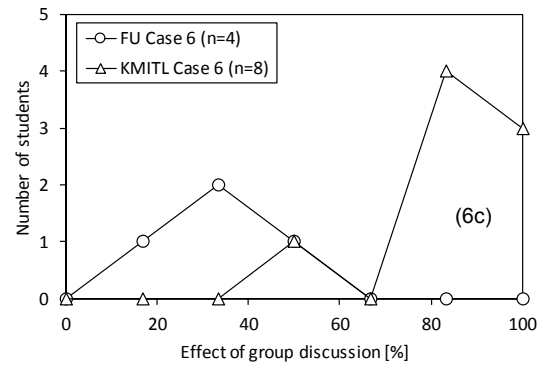
Case 4: He put office shelf (90kg) on the dolly with female employee.



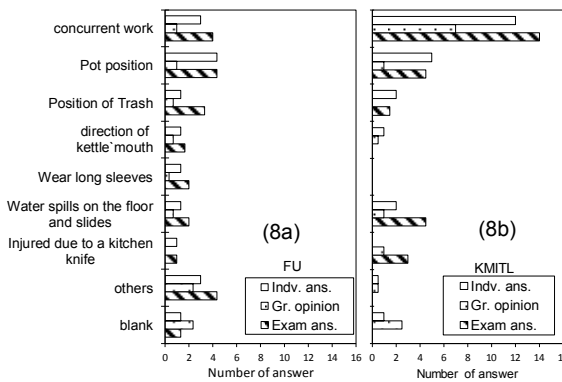
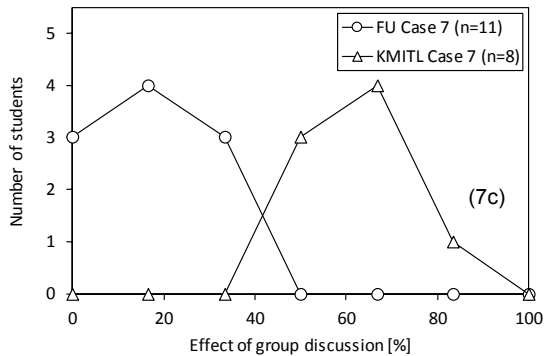
Case 5: He move cardboards from top to floor.



Case 6: He is going down from the second floor with a broom and a filled water bucket.



Case 7: He loads the heavy bags to a dolly.



Case 8: She washes dishes in kitchen while boiling the water.

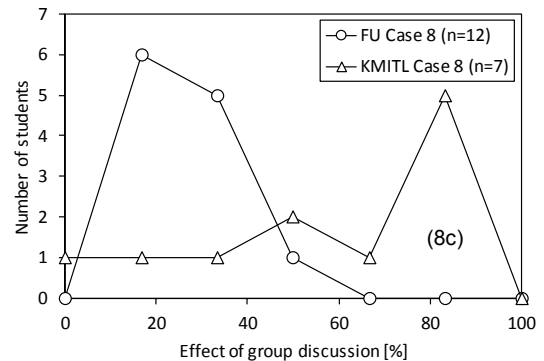


Figure 3: Individual, group and neither individual nor answer of KYT final examination results of (a) FU (n=33) and (b) KMITL (n=28) and (c) effect of group discussion of both FU and KMITL students.

Effect of role in-group discussion on the KTY final examination

As the procedure, (ii) the students were made in-group and exchanged their opinion. During being in-group, they were asked to be a leader, secretary, presentation, commentator, reporter, respectively. Inclination of answers were also investigated each role be influent on the KTY final examination.

Figure 4(a) and (b) show the ratio of the type of answer base on role in-group of FU and KMITL students. In figure 4(a), the ratio of individual answer of FU students of secretary and report are below than 50% that the role of reporter is the lowest than others in-group that is 44.8%. In addition, the percentage of un-role as general member is 60%.

On the other hand, the ratio of group answer influent on the KYT final examination of FU students of secretary, commentator and reporter are higher than 25%. The role of commentator is the highest ratio than others in-group which is 30.3%. However, the percentage of un-role as general member is 15.0%.

In case of 4(b) KMITL students, percentage of individual answer in figure 4(b) shows that the secretary and commentator are below than 50% and both are the lowest ratio than others in-group that is 41.7%. It can be considered that both FU and KMITL students, during being in-group, the role of secretary and commentator be influent on the KTY final examination than others.

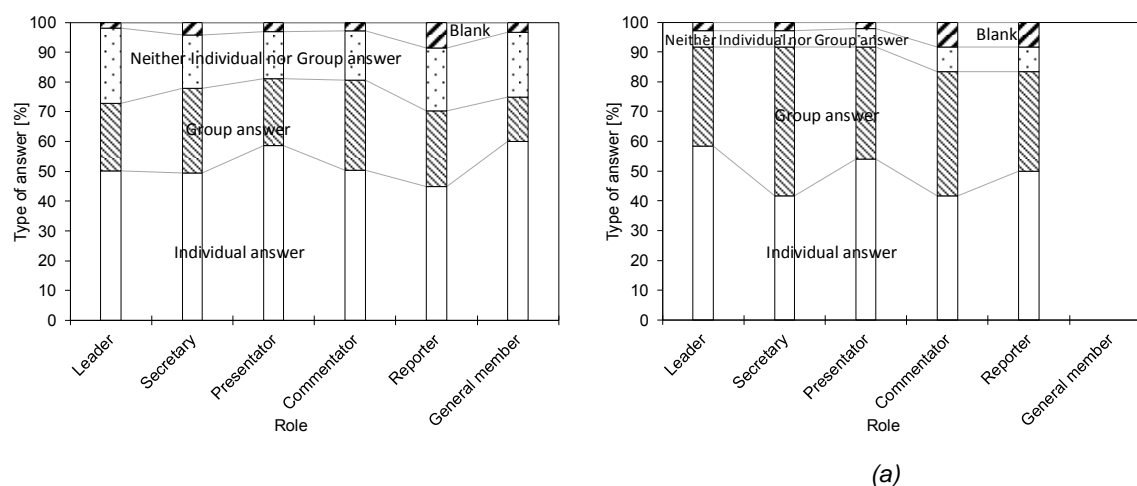


Figure 4: individual, group and neither individual nor answer of KYT final examination results of (a) FU (n=33) and (b) KMITL (n=28) and (c) effect of group discussion of both FU and KMITL students.

Conclusions

The different cultural backgrounds on KTY for junior year of undergraduate students of chemical engineering department of FU, Japan and KMITL, Thailand. Both the individual answers were the most influent to KYT final examination than the group discussion answer or the neither individual nor group discussion answer. The individual answer of FU are 52.5% and 49.4% of KMITL, respectively. Furthermore, there were the opinions in "case study no. 2: he cuts the vinyl rope by using box-cutter knife for unpack the cardboard", "case study no. 4: he put office shelf (90kg) on the dolly with female employee", and "case study no.7: he loads the heavy bags to a dolly" which observed only FU students. Finally, during being in-group discussion, the role of secretary and commentator be influent on the KTY final examination than leader, presentation and reporter.

Acknowledgments

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