2321A

Education activities for solving transportation problems in High Schools in Mountainous Areas

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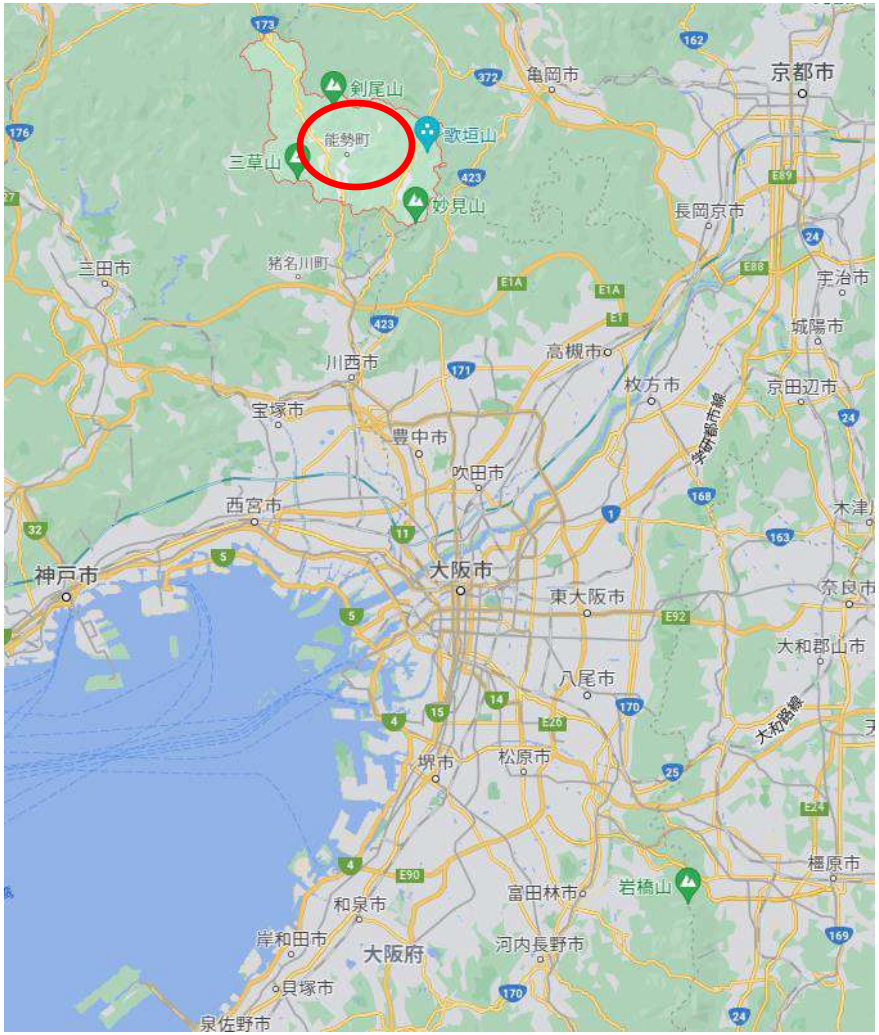
Purpose of the Study

- By providing high school students at the Nose Branch of Osaka Prefectural Toyonaka High School, which faces many safety issues unique to mountainous areas, with a new means of transportation called e-bikes, we aim to improve their problem-solving skills by supporting their learning about transportation, and to develop solutions to regional issues as a whole. The project will also aim to develop the e-bike as a solution to overall regional issues.

- It is expected that high school student-centered efforts will lead to increased awareness of the issues among local residents, such as the "Association to Support High Schools in Nose," and raise awareness of traffic safety, as well as the development of models that can be applied in other regions.

Osaka Prefectural Toyonaka High School - Nose Branch



Nose Town (wide area map, from Google Map)

Nose Branch High School Area (from Google Map)

Nose Branch High School (Photo taken on September 22, 2021)

Research Overview

- Traffic engineering approach:

  Actual driving behavior was measured and verified from safety and health perspectives, and the results were shared at the workshop.

- Urban and transportation planning approach:

  The status of school routes and safety measures were verified through workshops.

- A pedagogical approach:

  The educational effectiveness of the project is verified by measuring the change in knowledge, awareness, and behavior related to traffic safety as a result of acquiring new means of transportation.

- An Environmental Economics Approach:

  Measure and visualize the effect of e-bike use on the amount of time students and their families are restrained and on the increase or decrease in greenhouse gas emissions.

Aim of the Research

Gaining perspective and WS Theme

Before joining WS

How to use your bicycle safely

Improving the road environment for the safe use of bicycles

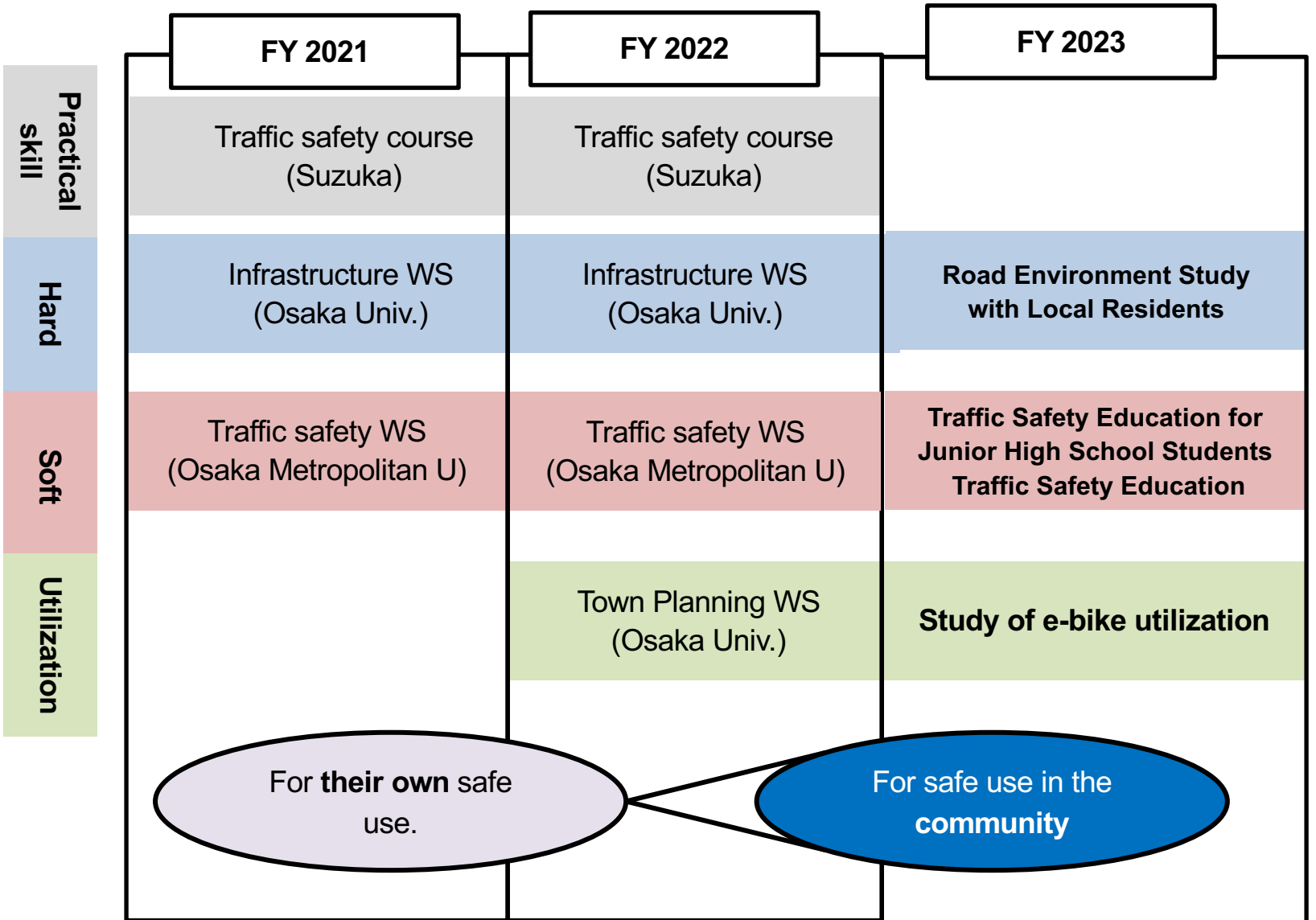
Improving transportation systems using bicycles

Ability to acquire roles at the stage of acquiring perspectives on traffic

Level 0	Self-centered role acquisition	They are not caring in any transportation other than the one they are currently using, and they have no information on other transportation.
Level 1	Subjective role acquisition	While grasping other transportation, they seek the convenience of only their own transportation.
Level 2	Second-person correspondence role acquisition	They understand that their transportation are different from others, and they understand their relationship with others (safety).
Level 3	Third-person correspondence role acquisition	Students can grasp the characteristics of other transportation, and can understand the advantages, disadvantages, and views of their own and other means of transportation.
Level 4	Role acquisition of Generalized others	In addition to bicycles, students can grasp the advantages, disadvantages, roles, and limitations of each mode of transportation in the entire system and consider improvement proposals.

Attempt to reach Level 4 perspective through a series of workshops

Development of previous workshops



1. A case study of behavior change related to the safe use of bicycles by high school students using naturalistic data

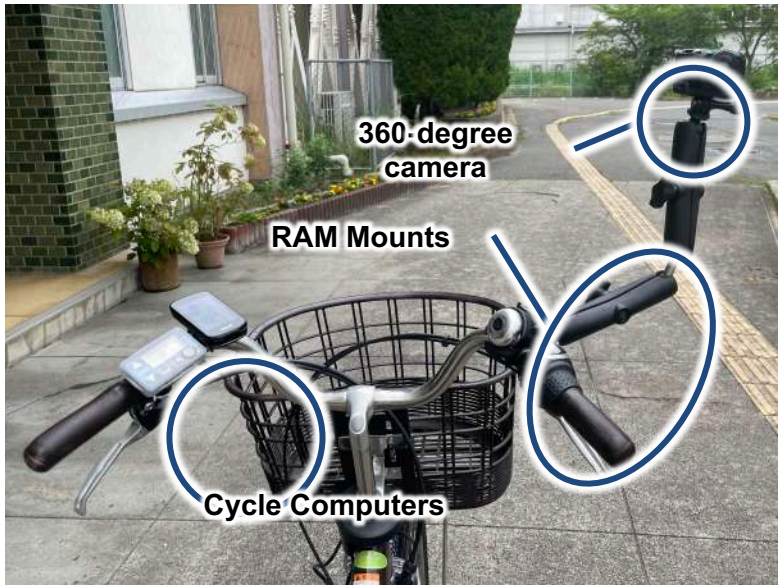
Research Objectives

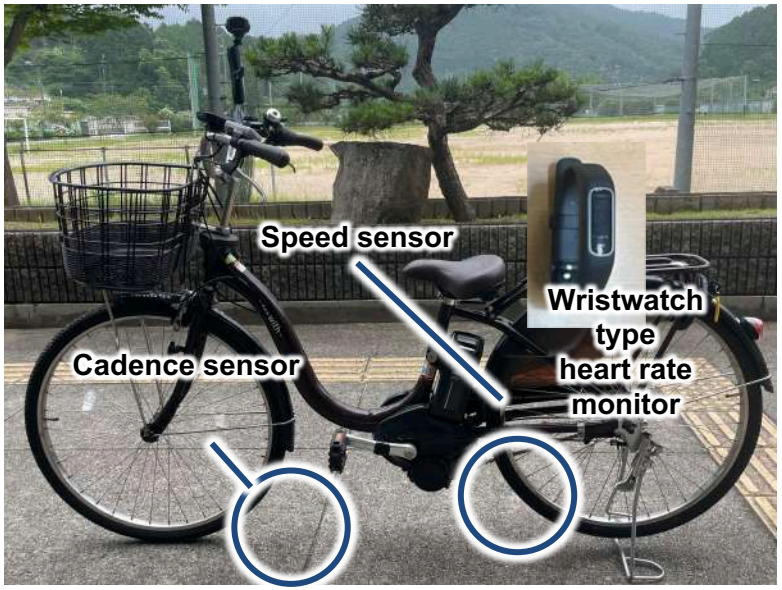
Objective: To clarify the process of behavior change through the implementation of traffic safety education

	Education: Implementation of traffic safety workshops	Psychology: grasp internal factors	Action: Verification of actual behavior
			
Objective	**Verification of learning effects**	**Examination of the internal factors of behavior change**	**Verification of the degree of behavior change**
Evaluation	**Rubric**	**Questionnaire**	**Naturalistic Data (Video and log data)**
Theory	Inquiry-based learning model 1)	Comprehensive Behavior Change Model 1)	

1) Adopted systematically organized by the Norwegian Road Safety Council

How to obtain naturalistic data





Survey Period	November 2021 ~ December 2023
Total amount of data	Total 18 (10 males / 8 females), 2064.5 km, 133.6 hours
Methodology	As a general rule, each student spends 5 days (going to and from school) and commutes to school with a measuring device attached.
Acquired data	Video, position, height, speed, cadence, number of heartbeats
Perspective	✓ Analysis of changes in the frequency of actions (7 items) by counting actual actions (explained on p. 7) ✓ Analysis of changes in behavioral indicators using log data (speed, heart rate, etc.) (explained on p.8) ✓ Extraction of video clips of safe and dangerous behaviors for use in WS

Example Data ①: Failing to hook-turn (both groups)

Example Data ②: Driving on the sidewalk at 10 km/h or more (both groups)

Example Data ③: Stopping at stops (A-group only)

Example Data ④: Consideration of methods to avoid danger (both groups)

Behavior change index (1): Frequency of behavior counted and calculated from videos

	12 items to count	unit
Traveling items	① Wearing a helmet	Trip
	② Number of trips without earphones	time
	③ Number of stop sign compliance	Trip
	④ Number of Signal Compliance Counts	time
	⑤ Hazard avoidance behavior toward cars	time
	⑥ Number of road crossings	time
	⑦ Driving time on the right side of the roadway	time
	⑧ Sidewalk driving time	seconds
Commuter data	⑨ Number of trips	Trip
	⑩ Video time	seconds
	⑪ Total number of stop signs	spots
	⑫ Total number of signals	spots

Frequency of action for 7 items calculated	unit
1. Helmet wearing rate（①/⑨）	%
2. Percentage of non-wearing earphones（②/⑨）	%
3. Rate of driving on the left side of the roadway（1-(⑦+⑧)/⑩）	%
4. Signal Compliance Rate（④/⑫）	Times/ Spots
5. Stop sign compliance rate（③/⑪）	Times/ Spots
6. Frequency of practicing hazard avoidance behavior（⑤/⑨）	Times/ Trip
7. Frequency of road crossings（⑥/⑨）	Times/ Trip

Data to be analyzed

Samples have been obtained around WS-1, 3

Data on school attendance of 9 subjects a~f, l, n, o

(a, d, and f also cover data after elapsed from WS)

Flow of analysis

①Visually count (1)~(8), (11), (12) from video

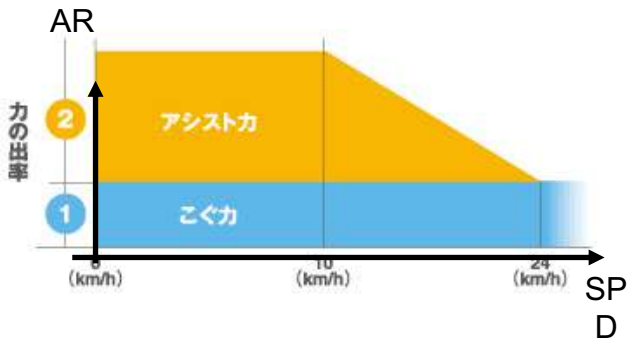
②Calculate the frequency of action for 7 items for each subject

③Compare the frequency of actions before and after WS

Behavior change index (2): Behavioral indicator calculated from driving log data

Metric name	Calculation method(Calculated for each subject)	unit
Average walking speed on flat ground	CAD>0, SPD>0, velocity SPD average value of dh=0	km/h
Average climbing speed	CAD>0, SPD>0, velocity SPD average value of dh=0	km/h
Average assist power on flat ground	CAD>0, SPD>0, E-bike's assist force average value of dh=0 *1	-fold
Average assist power on climbs	CAD>0, SPD>0, Assist power average value*1 of dh>0	-fold
Average exercise intensity on flat ground	Exercise intensity average value *2 of CAD=0	-
Average exercise intensity on a hill	Exercise intensity average value *2 of CAD>0	-

***1：Assist power AR**



$$AR = 2 \ (SPD < 10), \quad AR = 0 \ (SPD > 24)$$
$$AR = -\frac{1}{7}(SPD - 24) \ (10 < SPD < 24)$$

https://www.yamaha-motor.co.jp/pas/e-bike/basis/0001.html

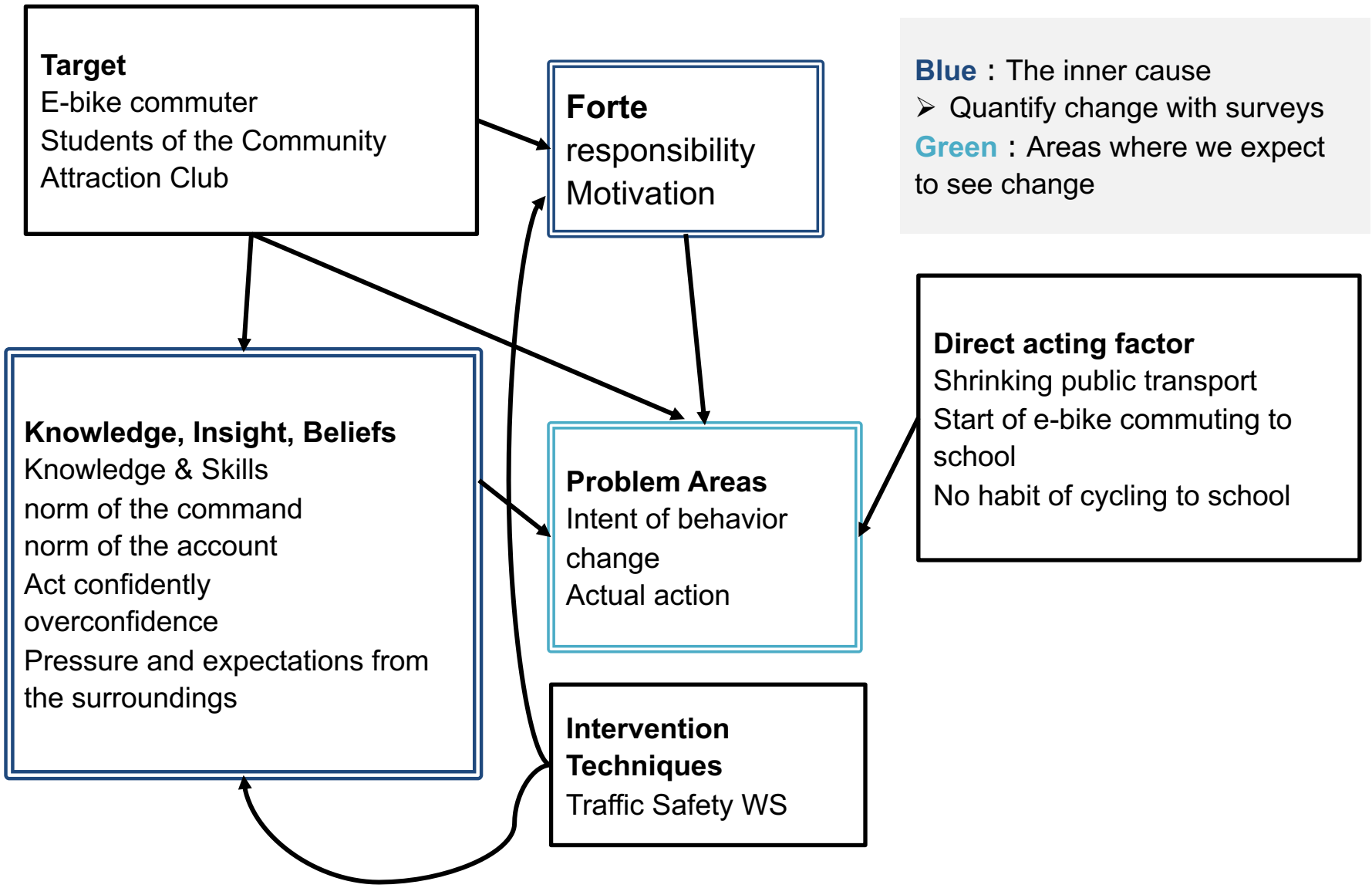
***2：Exercise Intensity EL**

Calculated by the Karvonen method

$$EL = \frac{HER - HER_{min}}{HER_{max} - HER_{min}}$$

SPD：velocity
CAD：Cadence
HER：heart rate
HER_{max}：Maximum heart rate for the trip
HER_{min}：Minimum heart rate for the trip
dh：Altitude difference between the two logs

Hypothesis of behavior change: Establishment of Internal Factors Involved in Behavior Change



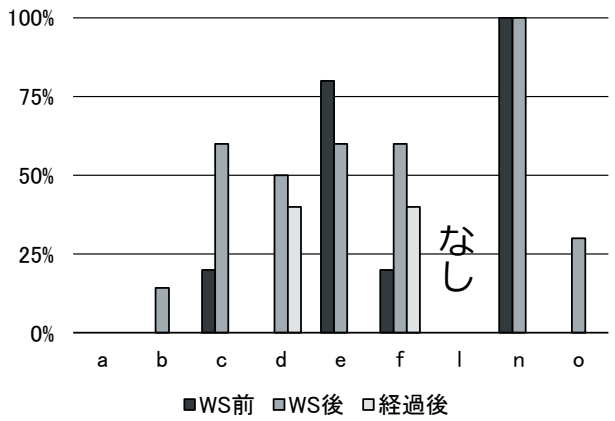
Reference: Norwegian Road Safety Council's Comprehensive Behavior Change Model

Composition of Traffic Safety WS

		WS-1	WS-2	WS-3	WS-4
Date of implementation		December 21, 2021	August 31, 2022	January 23, 2023	July 19, 2023
Participants		12	16	13	10 total
Team Composition *() With surveys		A Group : 6(3) B Group : 6(3)	A Group : 6(3) B Group : 6(2) C Group : 5(1)	A Group : 7(2) B Group : 6(2)	1st Grade Group : 5(0) 3rd Grade Group : 5(3)
G.W. Implementation details		Reflecting on actions using video Discussion of Safety Actions	Hazard Prediction and Avoidance training Discussion and explanation of safety actions	Reflecting on actions using video Discussion and explanation of safety actions	For junior high school students Traffic Safety Education enforcement
Pedagogy difference		A Group : Safety + Danger B Group : Danger only	Safety + Danger	A Group : Safety only B Group : Danger only	None
Evaluation items	**Action**	Naturalistic Data	None（A small number of samples taken before and after）	Naturalistic Data	None（A small number of samples taken before and after）
	Mentality	Questionnaire	Questionnaire	Questionnaire	Questionnaire
	Learning	None	None	None	Rubric

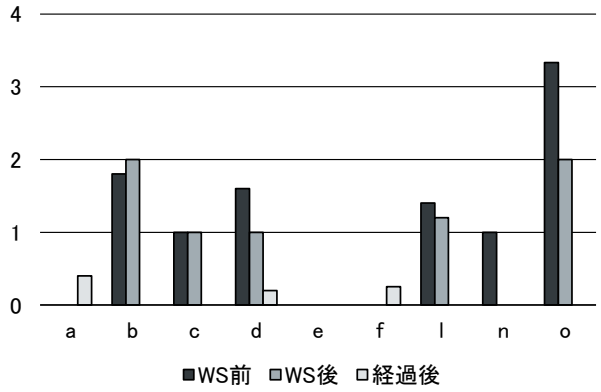
Before-and-after comparison of actual activity frequency

No significant change→ some slowing down was seen
There is room for improvement in the way indicators are taken

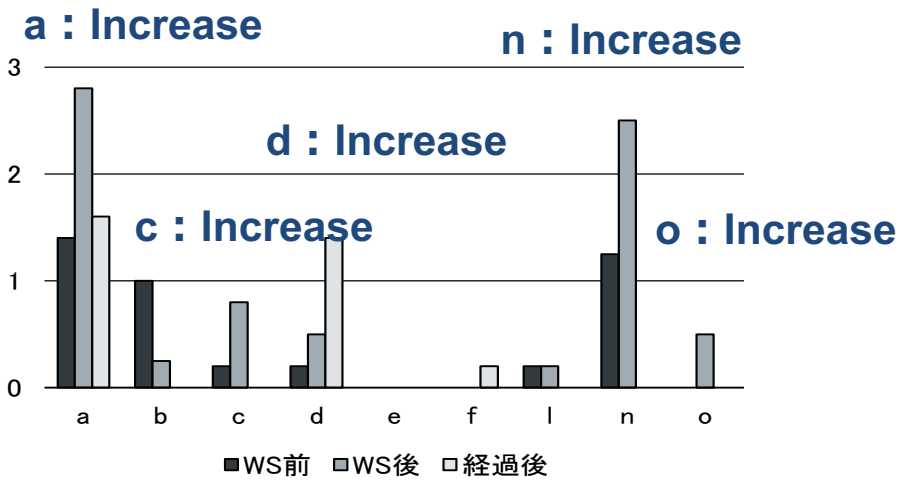


⑤ Percentage of stop compliance (%)

No significant change



⑦ Frequency of roadway crossings（time/Trip）



⑥ Frequency of practicing hazard avoidance behavior（time/Trip）

Behaviors that have changed (<u>but only to a limited extent</u>)

- Helmets worn (2 of 6)
- Improvement of driving while wearing earphones (2 out of 3)
- Frequency of practicing risk avoidance behaviors (5 of 9)

➢ **Knowledge and skills**, due **to surrounding pressures and expectations**

Behavior that did not change

- Practice of a two-step right turn in “a”
- Percentage of compliance with stop signs

➢ Existence of **overconfidence** and **pride**

Factor Analysis：Calculation of factor loadings

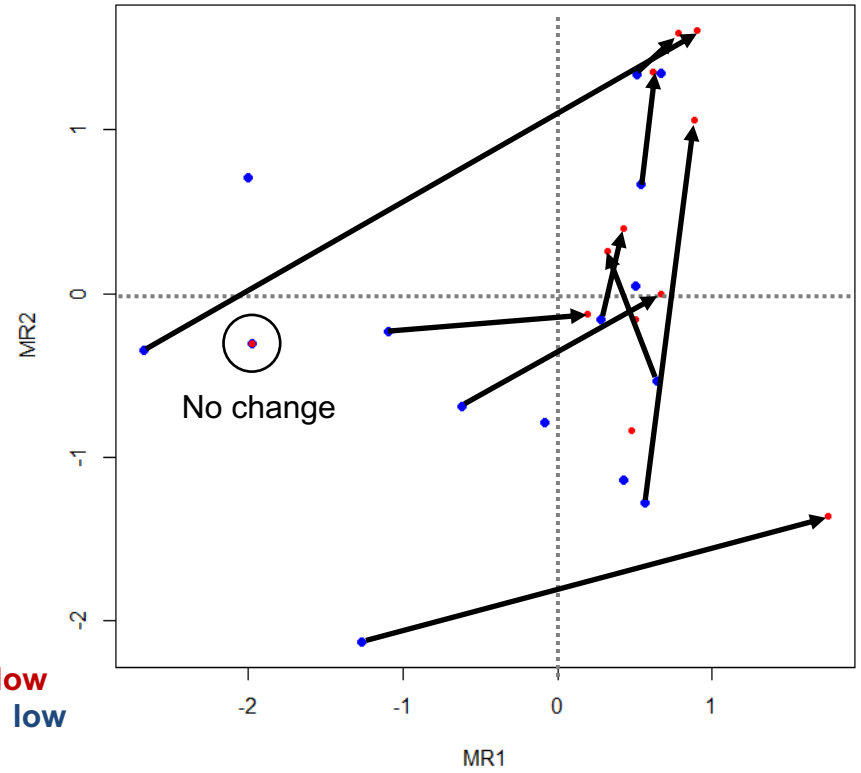
questionnaire	Questionnaire Contents	Attitude	Overconfident	In common
Q4	If everyone is following the rules and riding an e-bike, I want to do the same	.99	-.14	.93
Q2	If everyone rides an e-bike safely, I want to do the same	.94	-.15	.84
Q10	In order to continue commuting to school by e-bike, there is a responsibility to use an e-bike safely	.91	-.02	.82
Q3	You should follow traffic rules and ride an e-bike	.89	-.05	.77
Q13	Traffic safety education is meaningful	.82	-.07	.66
Q1	I should ride e-bike safely	.74	-.16	.52
Q11	In order for everyone to continue commuting to school by e-bike, there is a responsibility to use e-bikes safely.	.71	.08	.54
Q12	In order to be a role model for junior high school students, we have a responsibility to use an e-bikes safely	.68	.15	.53
Q1	Other students should also learn about traffic safety education	.60	.25	.49
Q15	I want to learn more about traffic safety.	.54	.21	.39
Q5	I'm confident that I won't cause a bicycle accident	.06	.93	.90
Q6	No matter how dangerous it is, I am confident that I can avoid it	.06	.90	.85
Q9	I don't think there will be any accidents in Nose	.15	.64	.47
Q7	I'm good at riding an e-bike.	-.29	.57	.34
	Cumulative Contribution	.50	.65	

Factor analysis using Promax rotation, Q8 is a model excluded because the commonality is 0.20

Factor Analysis：Transition of factor scores before and after WS for each subject

Safety Attitude:**low**
Overconfidence:**high**

Safety attitude：**high**
Overconfidence：**high**



Safety attitude：**low**
Overconfidence：**low**

Safety attitude：**high**
Overconfidence：**low**

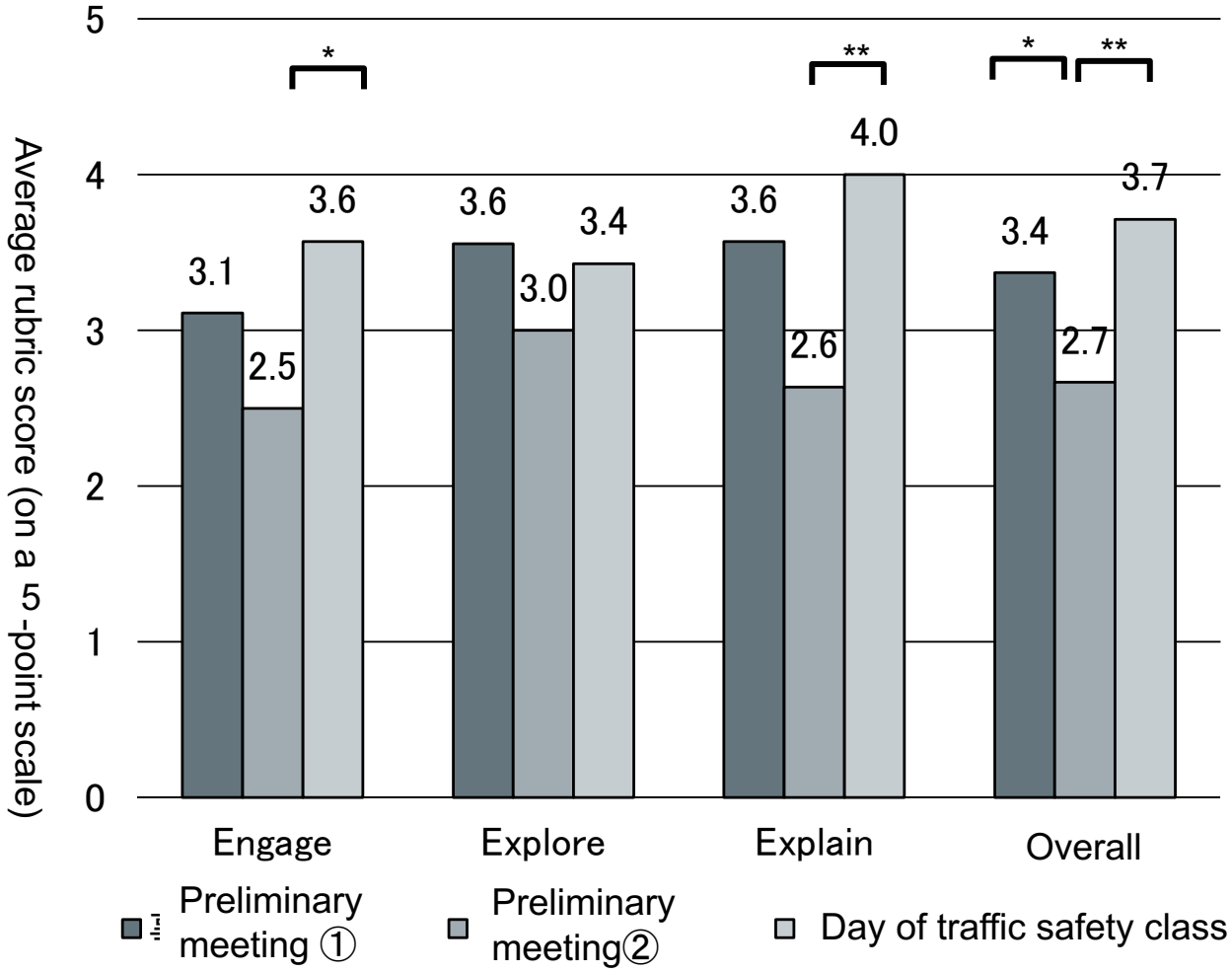
Safety attitude：-0.37 → 0.46 (t=-2.09*)

overconfidence：-0.23 → 0.29 (t=-1.41)

➢**Safety attitudes have improved** after WS, but **overconfidence and** pride **have also increased.**

Before WS：n=15、After WS：n=13、Common samples before and after：n=9

Transition in the Effects of Inquiry-based Learning Related to Traffic Safety

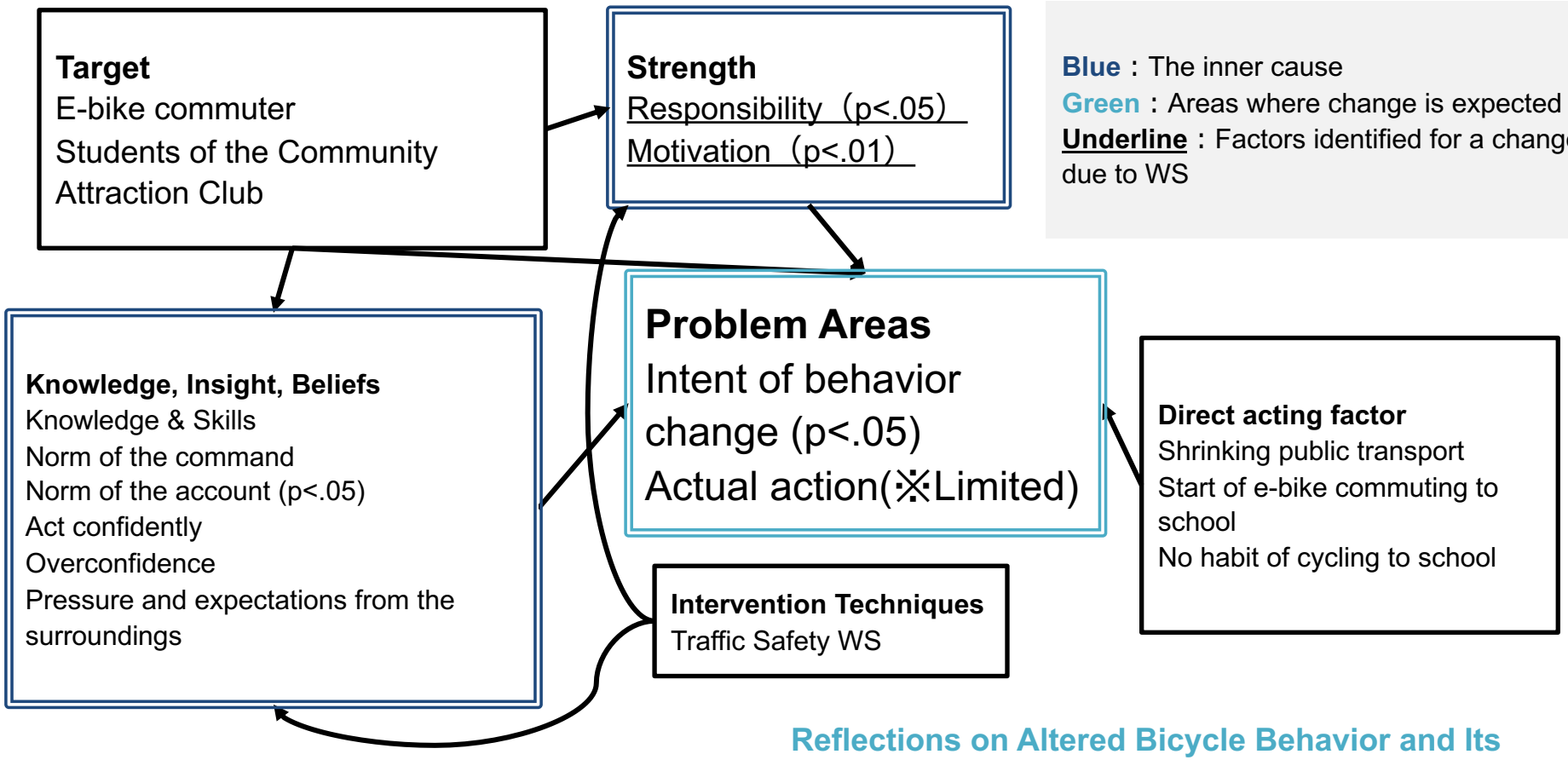


There is no significant difference between the groups but, **Engage**, **Explain scored the highest on the day.**

- The students feel that they actively participated in the WS and were able to explain well to the junior high school students

Advance (1)：n=8、Advance (2)：n=11、Day of：n=7、Analysis of variance・Multiple tests with the Tukey method、*：5%significance、**1%significance

Conclusion: Summary of changes in actual behavior and internal factors



Bicycle behavior that did not change

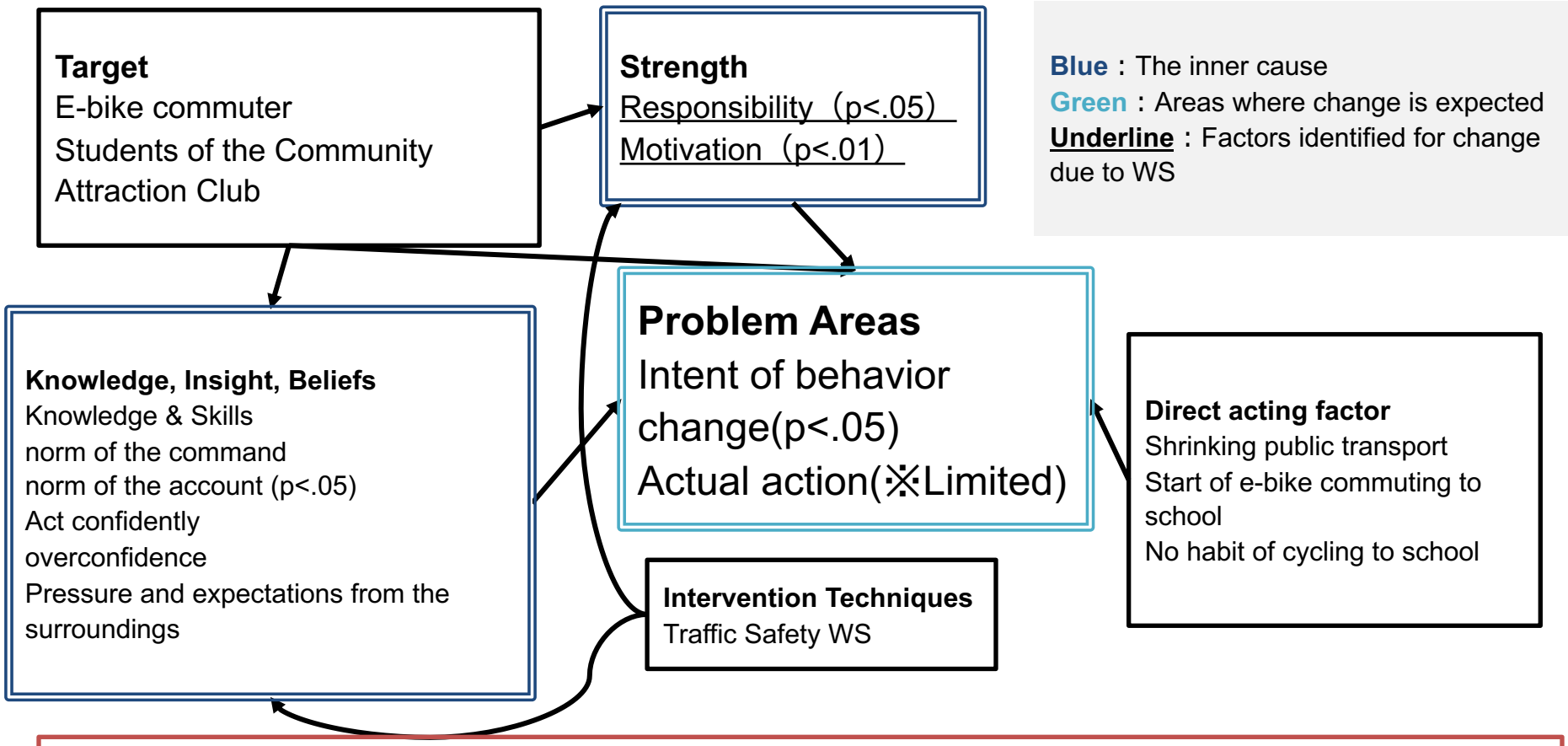
- Pause adherence rate（Full stop）
- Two-step right turn improvement

Reflections on Altered Bicycle Behavior and Its Internal Factors

Practicing Hazard Avoidance Behavior
Driving with Assists
Running with earphones
Wearing a helmet

Reference: Norwegian Road Safety Council's Comprehensive Behavior Change Model

Future Challenges



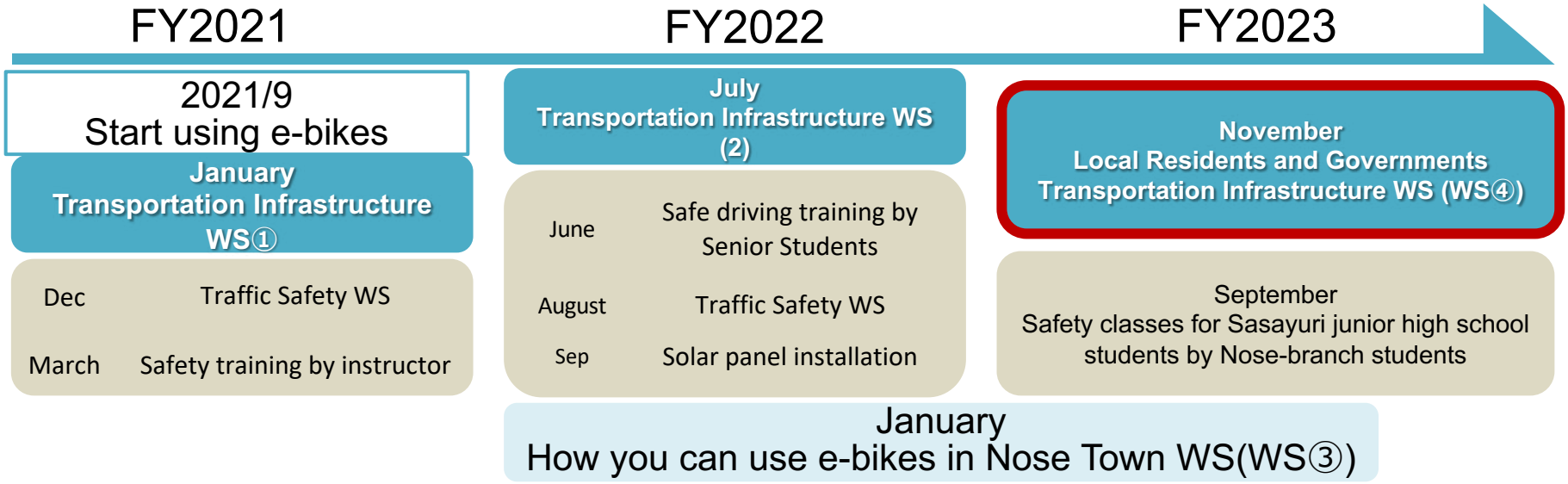
Future Challenges

- Methods for quantifying subject's behavior change (e.g., pause deceleration rate)
- Driving Context Extraction Method from Video Data
- Consistency verification of changes in each subject's internal factors with changes in actual behavior (non-aggregate approach)

Reference: Norwegian Road Safety Council's Comprehensive Behavior Change Model

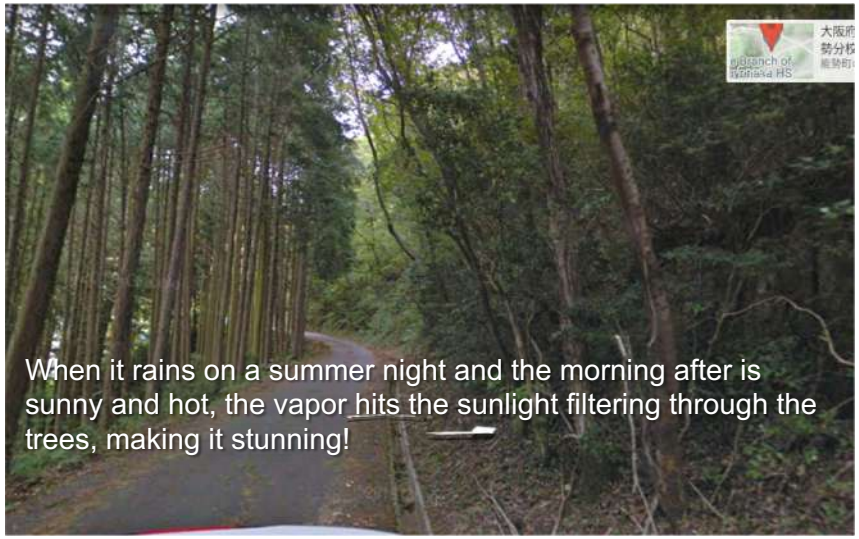
2. Transportation Infrastructure Workshop with Local Residents and Governments

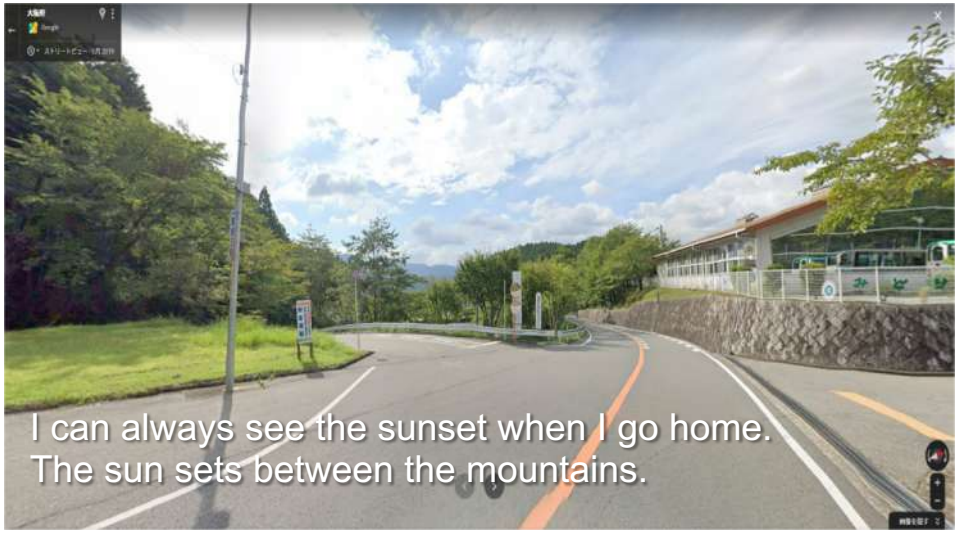
Past Workshops Conducted（WS）



	The 1st Transportation Infrastructure WS(WS①)	The 2nd Transportation Infrastructure WS(WS②)	Transportation Infrastructure WS with Local Residents and Governments (WS④)
Overview	Participants will be divided into groups to discuss the issues and attractiveness of the e-bike usage environment and propose improvement plans.		
Purpose	Problem Discovery	Improvement Proposals (Priorities)	Improvement Proposal (Feasibility)
Date of implementation	January 17, 2022	July 14, 2022	November 20, 2023
Target	Regional Attraction Club and e-bike users 13 people in total	15 Students 2 Employees of the town hall 2 University faculty members	19 Students 3 Employees of the town hall 4 Road Administrators 1 Police officer 1 Mayor

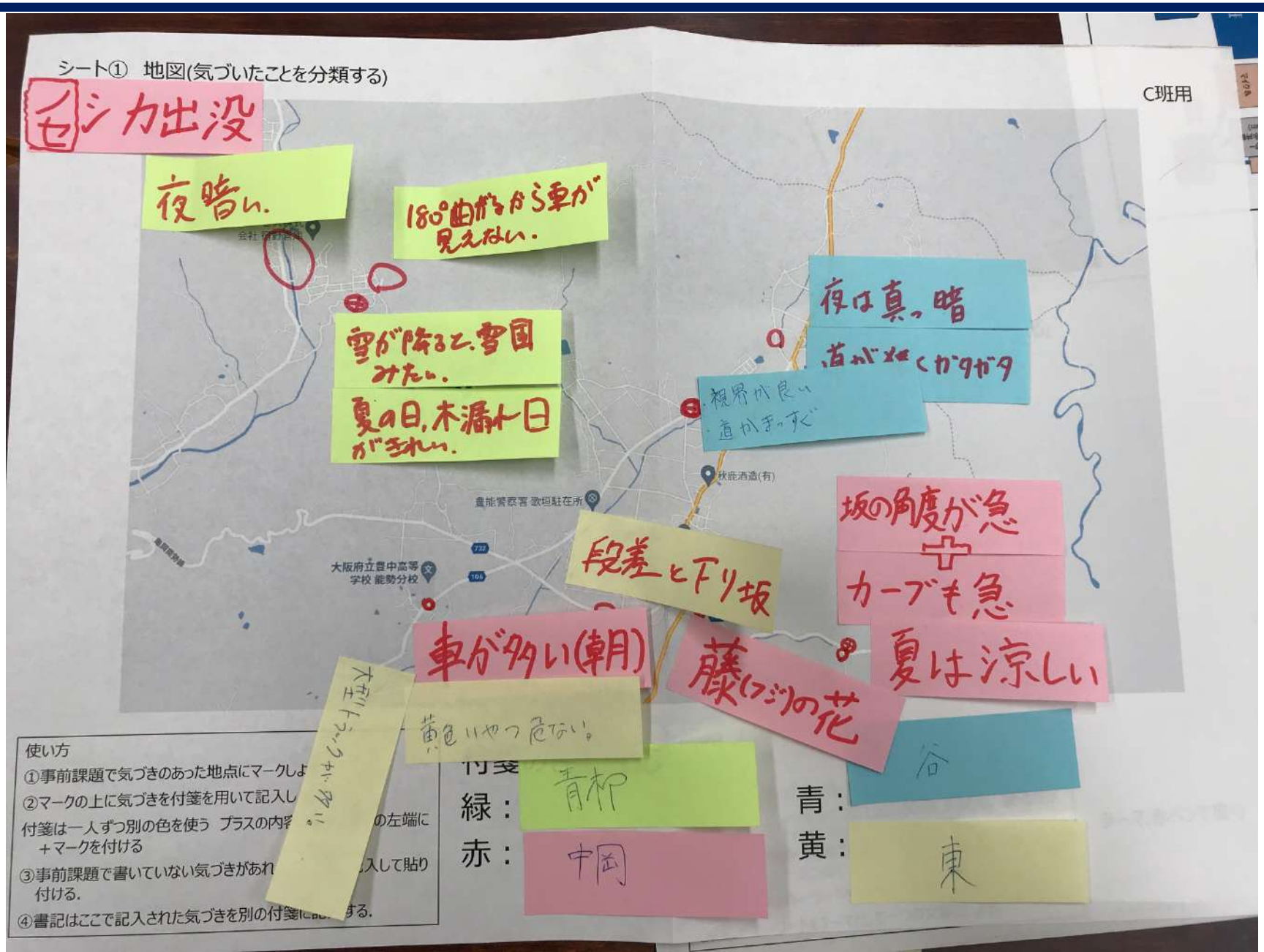
Examples of Existing Features



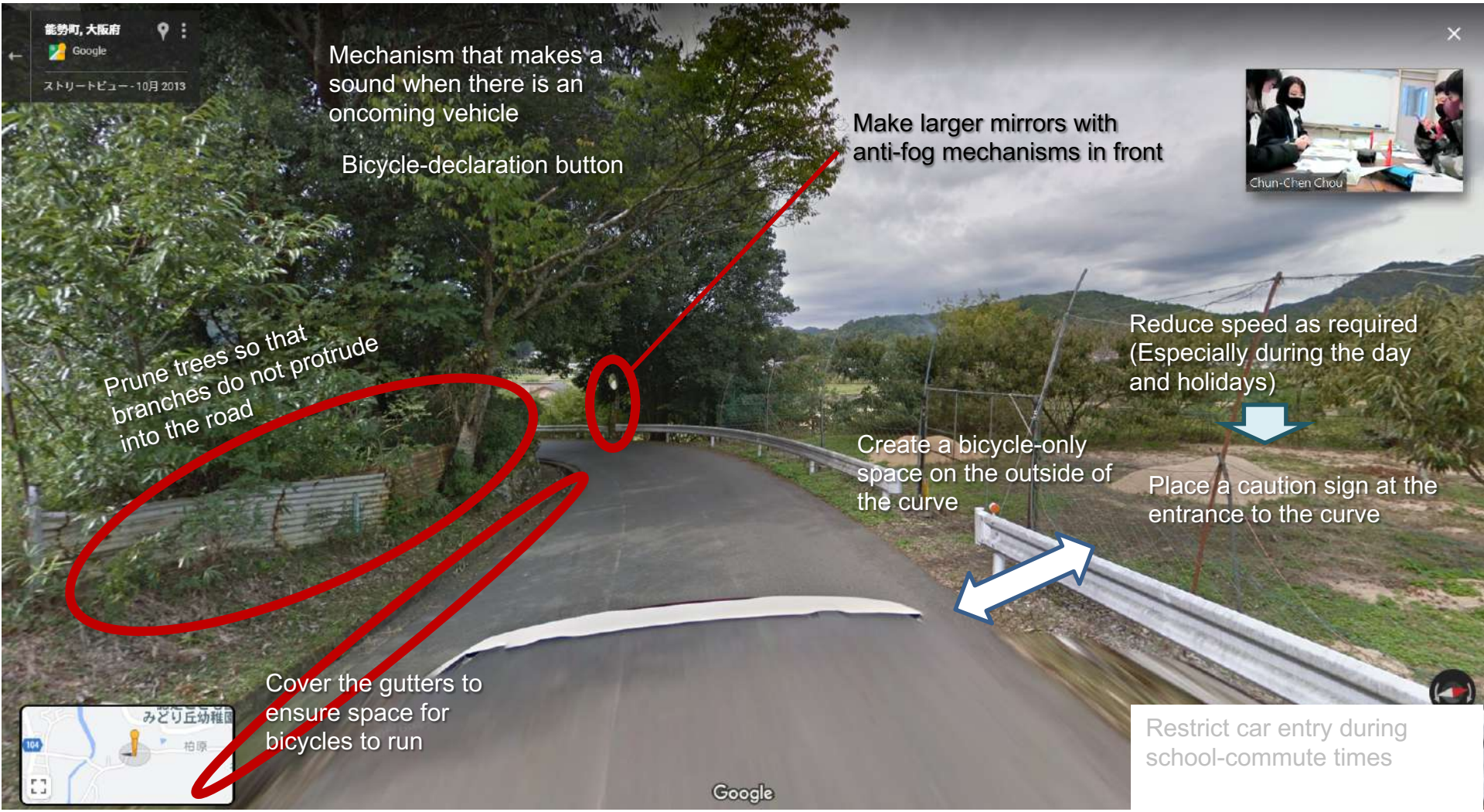


During the Workshop

What you felt about the route to school



Group A's proposal: For a specific curve in Meigetsu Pass

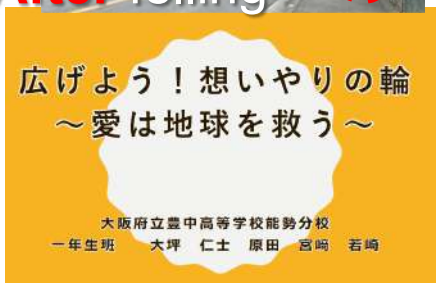


The suggestions took into account not only the perspective of bicycles, but that of car drivers as well.

Collaborative Activities Between Students and Town Hall After WS

✓ **After the workshop (November 24, 2022), an exchange of opinions between high school students and the town hall was held.**
The following issues were shared, and locations were identified and response policies discussed.

Weeding alongside pedestrian/bicycle passage spaces	Traffic of construction vehicles Maintenance of dirty curved mirrors	Road potholes
Cut down vegetation in consultation with road administrators and landowners (Town hall)	Requesting construction contractors to ensure thorough safety management (Town hall)	**High school students repair potholes in the presence of town officials (postponed due to rain)**



Exchange of views
At the Nose Branch High School

Nose town
Representative for the General Affairs Division, Regional Development Division, Industrial Construction Department, General Affairs Department

2023/7/19
Traffic Safety Class at Sasayuri Gakuen
FY2023
Preparing a Bicycle Hazard Map of Nose City

Traffic Safety Education for Junior High School Students

交通安全授業までの一連の流れ

日時	能勢分校	公立大
6月7日(水)	**事前打ち合わせ①【1時間半程度】** （授業の目標設定、内容）	
↕		**教材作成支援** （高校生の意見を元に教材作成）
6月26日(月)	**事前打ち合わせ②【1時間半程度】** （発表練習、改良）	
↕		**教材改良**
7月10日(月)	**交通安全講習【3時間】** （出原さんからフィードバック）	
↕		
7月19日(水)	**交通安全授業当日【45分程度】** （中学生に対し授業実施）	
↕		**アンケート分析** （中学生の意識変化・感想等）
夏休み明け	**フィードバック** （アンケート分析結果の報告）	

Collaborative Workshop between High School Students and Local Communities (November 20, 2023)

Preparation	High school students (+ university students) asked road administrators, police, local residents, and road users, or conducted workshops to consider measures that could be implemented jointly Summarize the awareness of problems felt by high school students as a presentation material High school students consider how to design presentation materials ⇒Introducing past initiatives + introducing current problems
WS Overview	High school students, local residents, and related parties will share their awareness of issues related to the bicycle usage environment and consider feasible countermeasures.
Participant	19 students, 3 high school teachers, Nose Town: 3 (Road Division, Regional Transportation Division), Osaka Prefecture: 4 (Road Manager) 1 police officer, 1 ward chief (resident representative)
WS Flow	Explanation of past activities by high school students and introduction of current commuting status Group work to consider countermeasures for dangerous areas Sharing the results of group work Overall Summary

WORKSHOP

Traffic Safety for High School Students

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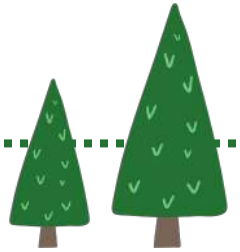

01 Dangerous places on the commuting path

02 Video of the danger area

03 Request to the road traffic manager

04 Request to the drivers

05 What high school students can do

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01

Our Transportation Issues

Dangerous places on the commuting path

Side streets in the middle of sharp curves make it difficult to see bicycles coming out of the side streets and cars going around the curves.

03

Request to the road traffic manager

03

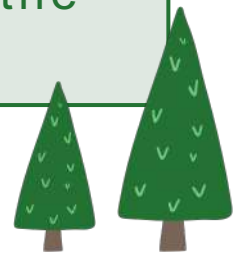
Request to the road traffic manager

Put reflective material on the guardrail

Installing a curved mirror

Merit

- Can confirm if cars are coming
- The presence of the bicycle can be confirmed from the car side.



Discussion of Possible Improvements

Additional curved mirrors or angle adjustment

Ask people to slow down only at certain times of the day

04

Request to the local residents and truck drivers

04

Request to the local residents and truck drivers

Be aware that it's a school route

Pass bicycle slowly on a straight road

Slow down and ensure safe drive during school commuting time

Don't pass students even in a hurry.

What high school students can do

05

05

What high school students can do

Check left and right

Installing reflector on a bicycle

Creation of a jumping boy

Communicate with drivers and give a way

グループワークの作業シート　取り組み主体ごとに出来る対策の検討

A 班

記入方法：選定した危険箇所について，現状・あるべき姿・理想の姿をそれぞれの立場から話し合い、記入して下さい.

選択した危険箇所	府道104号線付近の見通しの悪いカーブ

	高校生	道路管理者（大阪府、能勢町）	交通管理者（警察）	地域住民	トラック事業者・ドライバー
現状 ・運転行動やリスク ・安全対策など	・先が見えない（対向車） ・速度が速い	・カーブミラーは死角点のため ・ミラーにうつる光が見えない	・通学時間のパトロール	・体操に身を入れ ・沿道からのはみ出し →事故誘発	・速度オーバー
あるべき姿 （現実的な対策）	・危険を発見し、各区長さんへ ・通学路を行政へ知らせる	・法律の範囲内で木を切る ・通学路の幅を30cm未満にする	・ガードレールに反射板を付ける	・会議にかけ行政へ	・普通車により カーブに色をつけてもらう
理想の姿 （理想的な状態）	・	・道路をよくする		・所有者が管理	

グループワークの作業シート　取り組み主体ごとに出来る対策の検討

B 班

記入方法：選定した危険箇所について，現状・あるべき姿・理想の姿をそれぞれの立場から話し合い、記入して下さい.

選択した危険箇所	松風台

	高校生	道路管理者 （大阪府、能勢町）	交通管理者 （警察）	地域住民	トラック事業者 ・ドライバー
現状 ・運転行動やリスク ・安全対策など	スピード落とす 夜が暗い	道幅は一応OK 退避所アリ 高欄雪割配付設置		〃 小中の通学路にも	生活に使う
あるべき姿 （現実的な対策）	通学路として使用していることの認知 HP・紙などで情報発信 反射板	カーブミラーの清掃 反射板装着促進 ガードレールに反射 二名通学		反射板 必要に応じてまく	なるべく国道・府道を使う
理想の姿 （理想的な状態）	町民全体が通学路としての松風台を知っている 来ない（冬）	・全ての道に照明灯 ・カーブミラーの追加清掃 ・管理者側が全体に目を		クリスマスイルミネーション	通学時間帯は利用したい

グループワークの作業シート　取り組み主体ごとに出来る対策の検討　　C 班

記入方法：選定した危険箇所について，現状・あるべき姿・理想の姿をそれぞれの立場から話し合い、記入して下さい.

選択した危険箇所	下田尻の交差点から能勢分校にかけて.

	高校生	道路管理者（大阪府、能勢町）	交通管理者（警察）	地域住民	トラック事業者・ドライバー
現状 ・運転行動やリスク ・安全対策など	・できるだけ路側帯の中を走る. ・あまり左右を気にせずとびだしている?	・カーブミラーがたりない. よごれている（におう）	・高校の近くにはいない（小中に集まっている）	・スピード速め	・通学路をあまり認識していない.
あるべき姿 （現実的な対策）	・一旦停止 ・左右確認	・自転車のためのカーブミラーがほしい.	・生徒の見守り. ・十字路に立って自動車の通行をおとす 現状を知ってもらう.	・自転車を抜かすときはまっすぐな道でゆっくりと.	・通学路ということを認識してもらうためかんばん作る.
理想の姿 （理想的な状態）		・横断歩道をつくる ・自転車用の道を作ってもらう.	横断歩道をつけてもらう.	・できるだけゆっくりと走ってもらう.	

グループワークの作業シート　取り組み主体ごとに出来る対策の検討

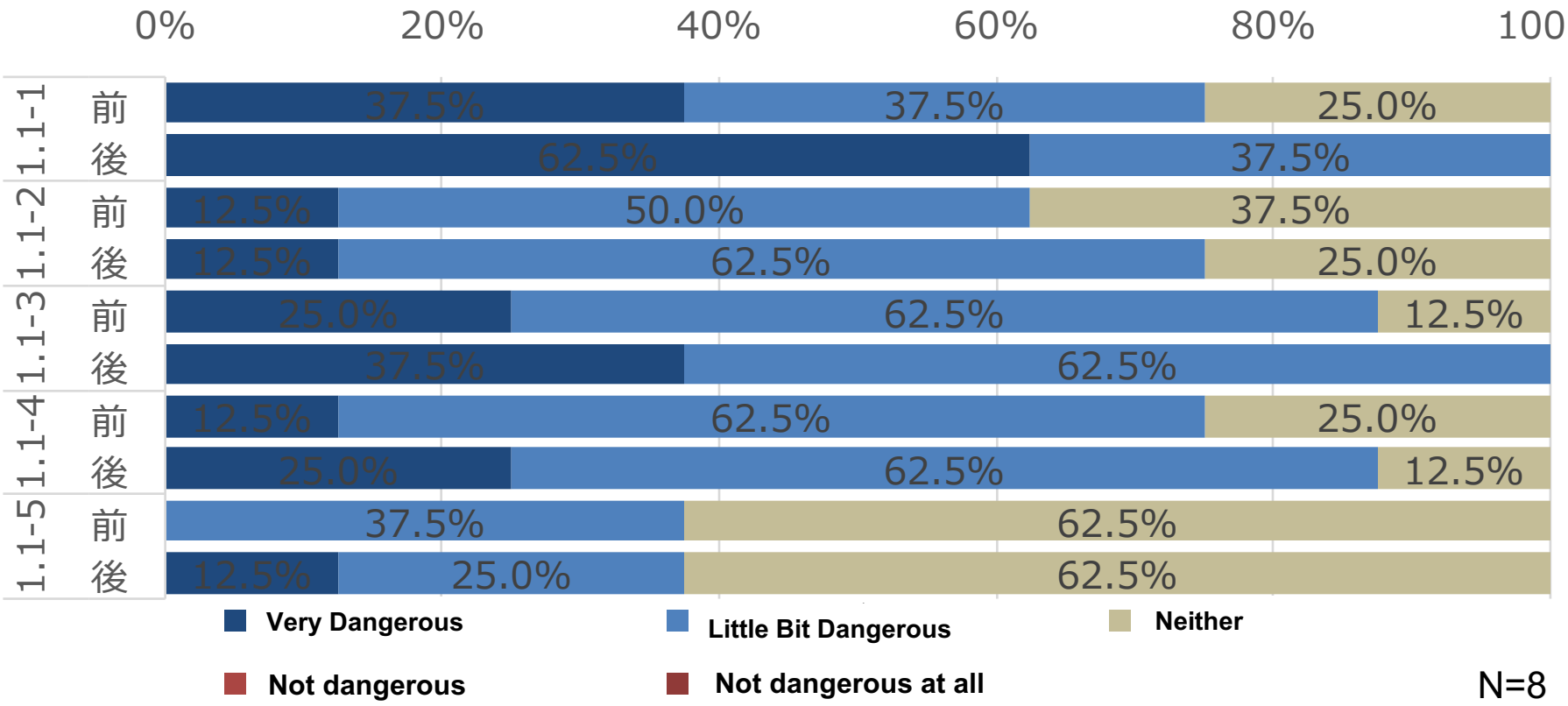
D 班

記入方法：選定した危険箇所について，現状・あるべき姿・理想の姿をそれぞれの立場から話し合い、記入して下さい.

選択した危険箇所	名月峠　向井住設前　溝

	高校生	道路管理者 （大阪府、能勢町）	交通管理者 （警察）	地域住民	トラック事業者 ・ドライバー
現状 ・運転行動やリスク ・安全対策など	下校中に落ちる	対策なし			落ちても分からない
あるべき姿 （現実的な対策）	気をつける	照明を置く			通学路と分かるようにする.
理想の姿 （理想的な状態）	グレイチングを置く	転落防止柵を設置			

WS Outcome: Transformation of Risk Perception among High School Students

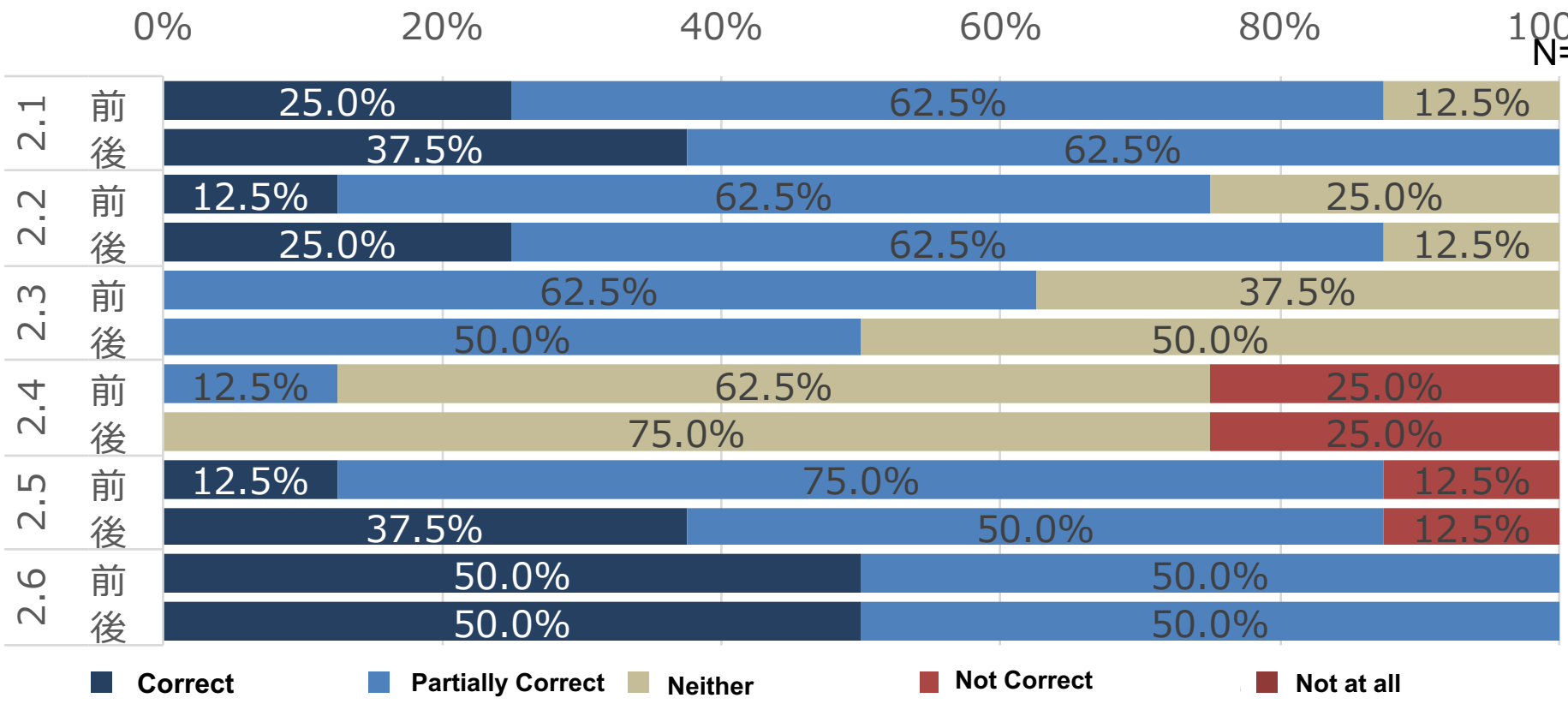


N=8

1-1 Curves with poor visibility, such as the Natsuki Pass
1-2 Steep uphill and downhill
1-3 Roads with damaged pavement or icy roads in winter
1-4 Roads with vegetation and anti-animal nets protruding from the roadside
1-5 Prefectural roads and other highways

The dangers for high school students were recognized to some extent even before WS

Outcome of the WS: Attitude change of the participants



2.1 I think that my daily (driving) behavior and work are related to traffic safety in the community
2.2 I think there is something I can do to help high school students get to school safely
2.3 I think that the main roads used for commuting to school should have space for bicycles.
2.4 To reduce the risk of traffic accidents, high school students should travel by public transportation
2.5 I think that it is necessary for high school students to be able to go to school safely in order to revitalize the community.
2.6 I think it is necessary to support the community activities of high school students in order to revitalize the community.

WS Results: Responses by Each Stakeholder

	State Road Admin	City Road Admin	Traffic Admin	Local Residents(Mayor)
Implemented	・Preparation of rivet ・Prepareation of shutter-bar ・Preparation of T-shaped road markings	・Cleaning and angle adjustment of curve mirrors	None in particular	・Safe drive such as slowing down
Not Implemented	・ Weeding of obtrusive plantings	・ Installation of reflective board on guardrails ・ Weeding of obtrusive plantings	・ Traffic patrol for high schoolers	・ Notification of school routes to local residents
Reason why it's not Implemented	・ Need to request due to private property	・ WS discussion alone did not narrow down to effective installation and location ・ Need to request due to private property	・ No request has been received from high school ・ Ready to implement if requested.	・ Waiting for high school to share information on school routes

- After the workshop, it was confirmed that the above had been done through the hearings from the participants,
- It is hoped that information will continue to be shared among high school students and the government and residents

WS results: Reflective line-of-sight studs installed on the shoulder of the road

About one month later, the reflective gaze guide studs were installed by Ikeda Civil Engineering Office, in order to notify drivers of the dich on side of the road.

Results of Collaborative Workshops between High School Students and the Community

Implications for Collaborative Mechanisms

- ✓ Notify the community members and road users of high school student routes to school.
- ✓ When high school students sense a problem, they contact the road administrator through local residents (in order to get the community's opinion before the road administrator takes action).
- ✓ Sharing current issues with residents through ward leaders

Specific safety measures

- ✓ At curves with poor visibility, reflectors are attached to guardrails and sign posts instead of installing curve mirrors
  ⇒Road administrator checked the inventory of reflectors the next day and has already taken action
- ✓ Soft poles in front of hard-to-see gutters
- ✓ Increased police patrols during school commuting and dismissal times (as in the past)

Reactions and changes in awareness among participating "adults"

- ✓ Cognitive and attitudinal changes in the challenges faced by high school students before and after the WS
- ✓ All high school students share their issues with their workplaces, family acquaintances, etc., especially after the WS.

Induce spontaneous initiatives among high school students

The third-year high school students independently worked on the “Problem Exploration GS,” from problem setting to proposal of solutions, and the sustainability of regional transportation in Nose Town was taken as one of the themes.

January 21, 2023 @ Nose Joruri Theater

3. Possibility of Environmental Economics Approach

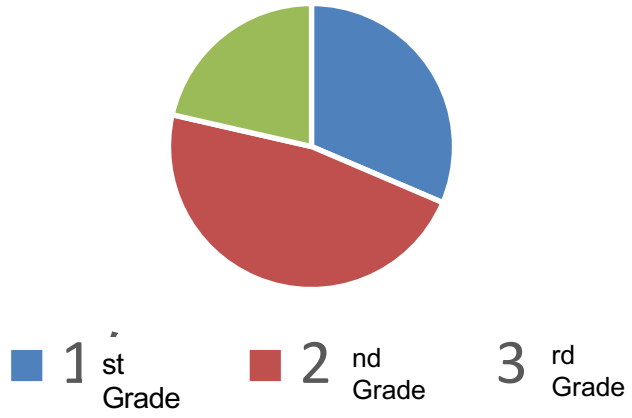
Respondent Attributes

Number of respondents：70

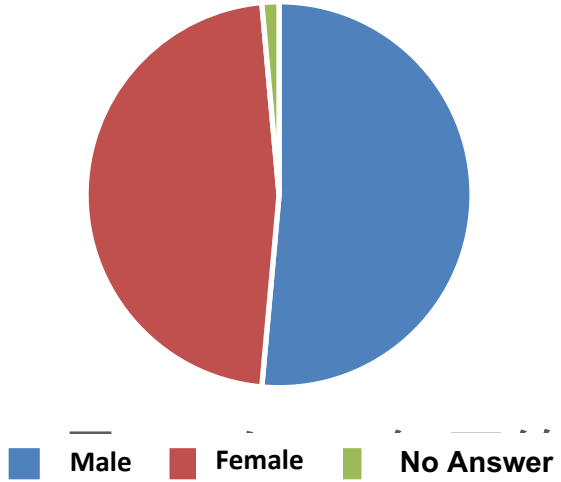
First grades　22　Second grades 33　Third grades 15

（Bicycle users：27）

Number of respondents by grade level



Male-to-female ratio



（WEB questionnaire　December 2023）

Household burden from frequency of pick-up and drop-off

■Fuel costs due to transportation

Assumed fuel consumption of the vehicle 23.8km/L
(*This is the overall average of the "Trends in average JC08 mode fuel efficiency of gasoline passenger cars" in the "Automobile Fuel Efficiency List" of the Ministry of Land, Infrastructure, Transport and Tourism.

Average 440 yen/week
(Gasoline price: 169.3 yen *Calculated as of January 7, 2024)

■CO_2 emissions from transportation

Gasoline Basic Unit 2.322 kg- CO /L_2
(*Database of emission source units for calculating greenhouse gas emissions of organizations through their supply chains,)
(Ver 2.5, March 2018, Ministry of the Environment)

CO_2 emissions calculated from the amount of gasoline required for transportation (kg/week)
Average 3.06 kg/week

Environmental Impact of e-bike Use

■ Electricity consumption by e-bikes

Average 179 kW/week

Reduction of CO_2 by e-bikes

CO_2 emissions per unit of electricity generated 0.516 kg- CO_2 /kWh

(Weighted average of CO2 emissions of each power generation method with their respective share)

(*Total Life Cycle CO2 Emissions Assessment of Power Generation Technologies in Japan (denken.or.jp))

CO_2 per hour by e-bike use: 1.34 kg- CO_2

Results of this project

<High school level: Results of visualization of own driving behavior

- Some increase in adherence to traffic rules and increased frequency of avoidance behavior in risky situations

<Regional level: Results of recognizing and sharing dangerous areas along school routes.

- Discoveries and proposals were made from a variety of perspectives, including the viewpoints of bicycles, automobiles, and community development.

*In order to ensure that students can ride their e-bikes safely, several rounds of traffic safety training were held (lectures by Dr. Yoshida of Osaka Metropolitan University, on-the-job training by the Suzuka Circuit Traffic Education Center and bicycle dealers [Bicycle Y-A]).

Future Prospects: Further Development at the Regional Level

- Holding further workshops to enable the students to make independent and proactive decisions based on the perspectives of others (pedestrians, drivers, etc.)
- Bicycles as "Public Goods
  - Indicators for prioritizing e-bike use
  - How to share e-bikes with more students
  - Use of e-bikes for purposes other than commuting to school
- Based on the results so far, high school students themselves will hold a workshop with various stakeholders to compile proposals to the Nose Town Office regarding the development of safe routes to school, which will be developed in the region.

公益財団法人 国際交通安全学会

International Association of Traffic and Safety Sciences