Developing Teachers for Society 5.0 Requires both Professional Education and Generic Skills Development – in the case of the Practical Seminar for Teachers.

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Introduction

The present study investigated whether programs conducted in the practical seminar for teachers promoted students' abilities as a teacher needed at schools in the context of Society 5.0.

The word of Society 5.0 was used in 内閣府 (2016) as the socio-economical stage in which ultra-smart society is aimed at. Society 5.0 is imagined to be a social stage following hunting society (society 1.0), agricultural society (society 2.0), industrial society (society 3.0), and information society (society 4.0). Specifically, society 5.0 is envisioned as a stage where a change is driven by scientific and technological innovation. The word Society 5.0 is used interchangeably with the word ultra-smart society. Ultra-smart society was defined as follow:

> A society that provides the necessary goods and services to the necessary people, at the necessary time, and in the necessary amount, that can respond to the various needs of society in a finely-tuned manner, that enables all people to receive high-quality services, and

that overcomes various differences such as age, gender, region, and language, and that enables people to live vibrantly and comfortably (内閣府, 2016, p11).

In 内閣府 (2016) ultra-smart society was characterized by "living in harmony between humans and robots leads to improvement of quality of life", "providing finely tuned and customized services" or "an environment where everyone can be a service provider." And the technological pre-requests were imagined as the systems which satisfy the following requirements: "various things need to be connected via networks, and they need to be highly systematized, and multiple different systems need to be linked and coordinated. This will enable us to collect and analyze a wide variety of data, and utilize it across the board among the systems that are linked and coordinated, thereby creating new values and services one after another (内閣府, 2016, p11)." Concretely, intelligent transport system, optimizing the energy value chains, and new manufacturing systems, were indicated as the core systems of technological pre-requests for Society 5.0.

The images of individual qualities or abilities that would contribute to the promoting Society 5.0 were conceptualized in 文部科学省 (2018): the ability of discovering or creating the new knowledge that prepares for technological innovation and value creation, and the ability of creating new businesses which is oriented to resolve social issues based on the new technologies. And, as the commonly required basic abilities, following abilities were assumed: the ability to understand and interpret documents or information and to communicate them with others, the ability to critique information or knowledge scientifically, and the ability to find the value in

information or knowledge. These abilities are not an entirely new abilities but assumed to be requested in any occasions for any persons. These abilities are assumed to be contained in the ability to keep learning in new social environments（文部科学省, 2018）.

文部科学省(2018) also referred to education organizations at school in response to Society 5.0. The policy of the education at school in response to Society 5.0 is assumed "to provide the necessary environments for the next generation of children to acquire the ability to survive in the future." At junior high school, it was considered to be important to develop the abilities such as comprehension, mathematical thinking or information utilization. The abilities to be developed in high school were considered to be the same as the abilities for Society 5.0. The environments or organizations of education to develop the abilities at junior high school were assumed that teacher and various staffs cooperate with each other as "team school" to provide environments that responds to individual needs. Additionally, it was assumed that practitioner of the education includes private business or various groups, the teaching materials are composed not only with the ones common among pupils but also ones customized for different individuals, pupils learn from not only paper materials but also materials gotten through ICT, and pupils learn not only at school but also at variety of places. And it was appended that education practitioner should measure and check the effects of their educational activities based on scientific and academic findings and scientific methods from the perspective of evidence-based approaches. At high school, it was assumed that pupils not only are taught by teachers at school but also learn at various places through searching and finding questions for themselves.

中央教育審議会 (2020) assumed that teachers at school under the context of Society 5.0 should be able to 1) recognize the change of society, life, norm, and set of values, 2) develop capacities from the perspective of cross-curriculum, 3) plan PBL projects 4) instruct how to use ICT, 5) conceptualize the learning plans customized to individual, 6) facilitate a cooperative learning among pupils, 7) manage teachers team to improve qualities of education, 8) improve practices with academic researches for education.

One of the missions of the practical seminar for teachers is to confirm whether teacher-training course achieved their education goals, and students are expected through learning in the course to find their challenges for future practices at school and to learn more to start professional life as teacher smoothly. The learning outcomes of the practical seminar for teachers are assumed: 1) developing students' sense of mission, responsibility and educational affection, 2) developing students' prosociability and social skills, 3) developing students' abilities to comprehend the stats of children and to manage class, and 4) developing students' ability to teach (文部科学省, 2017). On the other hand, there are no verifications to what extent the current teaching units developed teachers' abilities needed for schools under the context of Society 5.0 as far as we can see. The present study aimed to reveal the relation between the current teaching units and learning outcomes needed for teacher at school under the context of Society 5.0..

Analysis 1

The purpose of this section is to empirically examine the extent to which

the practical seminar for teachers constructed on the premise of a conventional mission（文部科学省, 2017）satisfied the demands for the development of qualities and abilities that teachers should acquire in response to Society 5.0. We measured the learning outcomes of the practical seminar for teachers with the qualities or abilities listed in 中央教育審議会(2020) –proposed as the abilities requested over subjects–. In other word, we applied the new indicators of learning outcomes to the old courses to determine the extent to which the new abilities were being developed by the old courses.

Method

Design and Class outline

The practical seminar for teachers in A university was composed with 6 teaching units – Ideal teacher image by SDS method, Identifying future issues using the six-color hat idea method, Role-playing, Classroom management plan, Lecture on education and Data Science. Only the unit of Data Science was newly added to examine whether Data Science unit developed students' educational abilities desirable for Society 5.0 compared to the other units which were conceptualized before the arrival of Society 5.0 was presented toward educational administration（under the influence of 文部科学省(2017)）. The present study compared the effects of Data Science unit and the other units on learning outcomes requested under Society 5.0.

文部科学省(2021a) noted that teacher should be able to teach how to use ICT for children at school and teacher-training course at universities were mandated to have the course "Theories and methods of education using

Table 1 Outlines of each unit on the practical seminar for teachers

Teaching units	Outline
Ideal teacher image by SDS method	Each student were asked to write as many items as possible on a single sticky note about their ideal teacher. Then, using the KJ method, the students were asked to organize these items into three categories and name the categories. And they asked to present these categories in form of SDS method: students present their ideal teacher images in the order that summary, details and summary.
Identifying future issues using the six-color hat idea method	Each student were asked to analyze their own current situation, think of their future challenges based on the current situation, analyze the feeling for the challenge, steps to achieve the challenges and merits/demerits of setting the challenges.
Role-playing	Each student formed two member units and performed role-play session: one student performed as a teacher and the other as a pupil. Two plots of the play were prepared that "responding to children who were concerned" and "morning meeting on news of interest". In plot of "children", students playing the role of pupil insisted that dreames never come true and students playing the role of teacher respond to the insists from the pupil. In plot of "news", teacher role showed the news, asked them their opinion on the news, and pupil responded to the asking. The topic of the news treated moral dilemma. Pairs seleted one of the two plots and wrote the script, and through the script, pairs were demanded to show how teacher could respond to childrens' disappintment to their life or respond to difficult questions of moral evaluation.
Classroom management plan	Students were asked to wirte classroom newsletter. In the letter, student wrote a school level educational goal, a class level educational goal, current status of pupils, educational acitivity plan for learning and school life, classroom management plan for cooperation with parents and improvement of classroom physical environment.
Lecture on education	Lectures by a incumbent teacher and a staff at education committee who had been employed in a school. A Incumbent teacher told educational issues from the perspective of school site, and staff at education committee told educational issues form the perspective of educational administration.

Data Science	Students learned the elementary steps of data science. (1) Read graphs (bar graphs, scatter plots, cross tables), (2) Summarize findings by synthesizing multiple graphs, (3) Create graphs on a given topic through handling statistical software and summarize them in an analysis report, (4) Synthesize findings from assigned graph reading through jigsaw learning and create findings as a team.

information and communication technologies"（文部科学省, 2021b). The trend should suggest institutional validity to select Data Science unit oriented to teacher development under Society 5.0.

Outlines of those units were descripted in Table1 and the guidance plans were shown in Momose & Ishikawa (2020). The guidance plan for Data Science unit was shown in Ishikawa, Momose & Shimozaki (in printing).

Participants and procedure

Survey was conducted in class through web form. Final sample was fifty-five students enrolled in the class (eleven 21-year-olds, forty-three 22-year-olds and one 24-year-olds; thirty-three males and twenty-two females). Explained the protection of personal information, the voluntary nature of responses, and that responses would be considered consent to the survey. The study design was approved by an ethics review board (Yamanashigakuin university: No. 21-010).

Items

Course goal: 4 items were displayed on the course syllabus: "Have a sense of mission and responsibility for education, and always be willing to learn from and grow with children", "Be able to carry out their duties in

cooperation and collaboration with teachers and staff, parents, and other concerned parties in the community", "Be able to provide appropriate guidance according to children's development and physical and mental conditions, and to manage the classroom in a disciplined manner", and "To be able to conduct classes with the knowledge and skills of the subject matter and the basic expressive skills required for teaching." All items were responded by 5-point-Likert scale "1 not applicable – 5 applicable."

This variable was incorporated into the questionnaire with the aim of measuring the level of the achievement goals of the practical seminar for teachers from the perspective of traditional practical teaching exercise. Those items reflected the desirable course goals in the practical seminar for teachers proposed through 中央教育審議会(2006).

Teachers' quality for Society5.0; 中央教育審議会(2020) suggested quality or ability requested on teacher in Society5.0 Era: "Ability to understand and recognize major changes in society and life, and shifts in norms and values", "Ability to develop students' qualities and abilities (competencies) from a cross-curricular perspective", "Ability to plan and implement problem-finding and problem-solving learning activities (PBL)", "Ability to provide instruction using ICT that effectively incorporates advanced technology", "Ability to envision a way of learning that is individually optimized for each child", "Communication skills to draw out a variety of opinions and learn from each other by exercising coordination and presentation skills", "Management skills to improve the quality of education in a systematic and planned manner through cooperation and collaboration with others based on the concept of team school "and "Ability to learn from academic research in pedagogy and other related

fields, and to link this to improvement and development." All items were responded by 5-point-Likert scale "1 not applicable – 5 applicable." This variable was incorporated into the questionnaire with the aim of measuring the effectiveness of teacher development of the practical seminar for teachers in response to Society 5.0.

Teaching units: the course was composed of 6 units – Ideal teacher image by SDS method, Identifying future issues using the six-color hat idea method, Role-playing, Classroom management plan, Lecture on education, Data science – and the extent to which students felt they had something to be learned from each units was surveyed. We set the question text as follow "How much did you learn from the following lessons?" and all items were responded by 5-point-Likert scale "1 not applicable – 5 applicable."

Analysis

Only Data Science unit was conceptualized under Society 5.0 and the other units were constructed before the announcement of Society 5.0. Statistical comparisons of the effects of teaching units on learning outcomes were performed among units and we mainly discussed the differences between the effects of Data Science unit and the other units on learning outcomes.

Results

Analysis of items on Course goal

To explore the number of factors of Course goal, diagonal SMC, MAP, parallel analysis and SMC parallel analysis were performed, and all of methods proposed one factor solution (Table2). The fit of Course goal to

Table 2 Pattern matrix of Course goal

Item	F1	h^2
Have a sense of mission and responsibility for education.	.75	.57
Have a sense of mission and responsibility for education, and always be willing to learn from and grow with children.	.75	.56
Be able to provide appropriate guidance according to children's development and physical and mental conditions, and to manage the classroom in a disciplined manner.	.70	.48
To be able to conduct classes by acquiring knowledge and skills in the subject matter and basic expressive skills for conducting classes.	.65	.42
Factor Contribution	2.03	

the one-factor structure was reasonably good (CFI=.976, RMSEA=.119). In addition, α coefficient was. 801. ω coefficient was. 802.

Analysis of items on teachers' quality for Society5.0

To explore factor structure of items measuring teachers' quality for Society5.0, explorative factor analysis was conducted. To explore adequate number of factors of teachers' quality for Society 5.0, diagonal SMC, MAP, parallel analysis and SMC parallel analysis were conducted. Parallel analysis, MAP, SMC parallel analysis proposed one factor solution and diagonal SMC proposed two factor solution. To decide the number of factors on teachers' quality for Society 5.0, fit indexes of one to three factor solutions were calculated through explorative factor analysis with maximum likelihood method: one factor solution showed CFI=.919, RMSEA=.101, AIC=46.781, BIC=62.693: two factor solution showed CFI=.989, RMSEA=.045, AIC=44.402, BIC=74.236: three factor solution didn't converge and fit index of three factor solution were not reported. Fit index

suggested that two factor solution was better than one factor solution and explorative factor analysis with maximum likelihood method (Promax rotation) was conducted specified on two-factor structure (Table3). First factor consisted of the items "Communication skills that elicit diverse opinions and mutual learning by demonstrating coordination and presentation skills", "Ability to understand and recognize major changes in society and daily life, as well as shifts in norms and values" or "Management skills to improve the quality of education in a systematic and planned manner through cooperation and collaboration with others, based on the concept of " team school." Those items represented the teachers' quality to conception or realization of education and the first factor was named "Conception of Education". Second factor consisted of "The ability to learn from academic research in pedagogy and other related fields, and to link this to improvement and development", "The ability to develop the qualities and abilities (competencies) of students from a cross-curricular perspective" or "Ability to provide instruction using ICT that effectively incorporates advanced technology." The items belonged to second factor represented the teachers' quality to improve education and the second factor was named "Improvement of Education." α coefficients of Conception of Education were. 834 and of Improvement of Education was. 709. ω of Conception of Education was .835 and of Improvement of Education was .733.

The item analysis of teaching unit

The average scores of items belonged to each teaching unit were shown in Table4. Paired-sample *t*-test among teaching units reached significant

Table 3 Pattern matrix of teachers' quality for Society5.0

Item	Factor		h^2
	1	2	
Communication skills that elicit diverse opinions and mutual learning by demonstrating coordination and presentation skills	**.80**	-.08	.57
Ability to understand and recognize major changes in society and daily life. as well as shifts in norms and values	**.79**	-.01	.62
Management skills to improve the quality of education in a systematic and planned manner through cooperation and collaboration with others, based on the concept of "team school	**.70**	.07	.55
Ability to envision how to optimize individualized learning for each child	**.69**	.05	.52
The ability to learn from academic research in pedagogy and other related fields. and to link this to improvement and development	-.12	**.92**	.71
The ability to develop the qualities and abilities (competendes) of students from a cross-curricular perspective	.27	**.52**	.53
Ability to provide instruction using ICT that effectively incorporates advanced technology	-.02	**.46**	.21
Ability to plan and implement problem-finding and problem-solving learning activities (PBL)	.20	**.43**	.33
Factor Contribution	3.09	2.58	

level ($F(5, 255)=5.527$, $p<.000$, $\eta^2_p=.098$). Multiple comparison (Holm method) revealed that Ideal teacher image by SDS method > Data Science ($t(51)=3.472$, $SE=0.144$, $p=.041$), Identifying future issues using the six-color hat idea method > Data Science ($t(51)=3.715$, $SE=0.124$, $p=.007$), Classroom management plan > Data Science ($t(51)=3.472$, $SE=0.144$, $p=.014$) and Lecture on education > Data Science ($t(51)=3.976$, $SE=0.111$, $p=.003$).

Table 4 The average scores of teaching unit

Teaching unit	M	SD
Ideal teacher image by SDS method	4.33	0.64
Identifying future issues using the six-color hat idea method	4.29	0.63
Role-playing	4.19	0.70
Classroom management plan	4.36	0.68
Lecture on education	4.28	0.77
Data Science	3.89	1.01

Additionally, clustering of teaching units was performed. To cluster teaching unit into different cluster based on similarity of responding among teaching units, hierarchical cluster analysis (Ward method) was performed and the analysis revealed that teaching units were divided into two different types of cluster. First cluster was composed of Ideal teacher image, Identifying future issues, Role-play and Classroom management plan. Second cluster was composed of Lecture on education and Data Science. First cluster was named "professional skill" because it was composed of the skills which were required in the classroom management or teaching in classroom. Second cluster was named "generic skill" because Lecture on education and Data Science cross over the skills required classroom or those skills were required in any profession (Figure1).

Relation between teaching units and learning outcomes

Table5 showed correlation among variables of teaching units and learning outcomes. And the results of regression analysis in which three learning outcomes (Course goal, Society5.0 Conception of Education and Society5.0

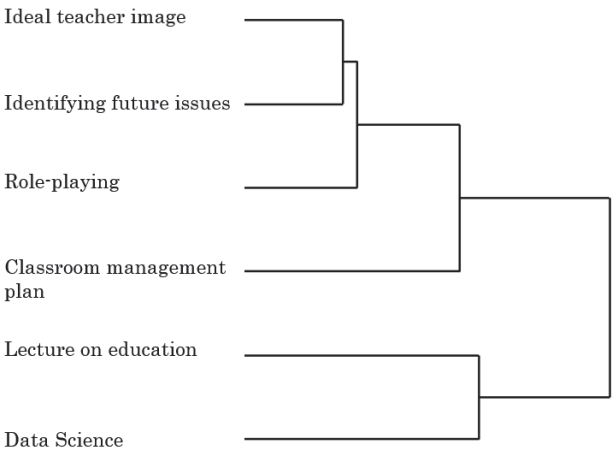

Figure 1　Hierarchical cluster analysis of teaching units

Improvement of Education) were entered as response variable and the two variables of teaching cluster (professional skill and generic skill) and interaction term of two teaching clusters were entered as explanatory variable.

In the model, teaching cluster of generic skill and interaction term (professional skill × generic skill) reached significant level on Society 5.0 Conception of Education (Table6). To reveal the details of interaction effect between professional skill and generic skill on Society 5.0 Conception Education, simple slope analysis was performed (Figure2). Figure2 showed that in the case of generic skill +1SD, the effect of professional skill on Conception of Education was not significant (β =.092, SE=0.233, p=.656). In contrast, in the case of generic skill −1SD, the effect of professional skill on Conception of Education was significant (β =−.442, SE=0.213, p=.023). The direction of simple slope in the case of generic skill −1SD to the level of

Table 5 Correlation among variables about teaching units and learning outcomes

	Course goal	Society5.0 Conception of Education	Society5.0 Improvement of Education
Teaching cluster of professional skill	.18	.04	.30 *
Teaching cluster of generic skill	.15	.35	.28 *

$^{**}p < .01$, $^{*}p < .05$, $^{+}p < .10$

Table 6 Regression analysis: learning outcomes as response variables and teaching cluster as explanatory variables

	Course goal	Society 5.0 Conception of Education	Society 5.0 Improvement of Education
Teacing cluster of professional skill	0.16	−.18	0.2
Teacing cluster of generic skill	0.04	0.39 *	0.19
Interaction term	0.09	0.28 *	−.11
R^2	0.05 +	0.23 **	0.12 **

Conception of Education suggested that the level of Conception of Education dropped into lower level in the case of professional skill +1SD compared with the case of professional skill −1SD. The significant drop of the level of Conception of Education in professional skill + 1SD when generic skill was −1SD suggested that orientation to or cultivating professional skill was not sufficient for nurturing the sense of Conception of Education, and both skills (generic skill and professional skill) were needed for cultivating Conception of Education (Figure2).

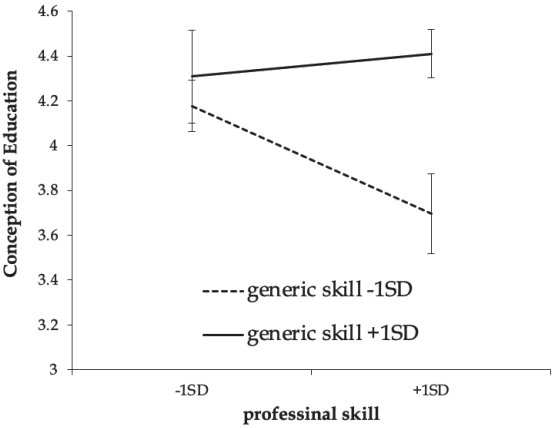

Figure 2　Simple slope analysis which showed the relation between Society5.0 Conception of Education and two teaching cluster

Discussion

The qualities required for teacher in Society 5.0 were proposed and listed, for example, in 中央教育審議会（2020), and the listed items were classified into two dimensions in our data: Conception and Improvement of Education. The factor of Conception contained the items that asserted the importance of developing teachers' quality of communication skills to coordinate learning, of skills to understand changes in society, of management skills to plan education through team school and of skills to optimize individualized learning. The factor of Improvement contained the items that insisted on the importance of teachers' ability to learn from academic research in pedagogy, to develop competencies of students from a cross-curricular perspective, to provide instruction using ICT and to implement PBL learning. The list of concepts at teacher-training goal in the situation of Society 5.0 demanded to universities proposed by the

education administration was not biased towards data science literacy or teaching skill for data science but might balance among teaching skills for the generic skills which pupils should acquire through life.

The practical seminar for teachers was composed with 6 teaching units – Ideal teacher image by SDS method, Identifying future issues using the six-color hat idea method, Role-playing, Classroom management plan, Lecture on education and Data Science. The perceived depth of learning for each unit was statistically different from each other. Concretely, the perceived depth of learning for Data Science was lower than Ideal teacher image by SDS method, Identifying future issues using the six-color hat idea method, Classroom management plan and Lecture on education. The 6 teaching units were classified into two teaching clusters: cluster of professional skills and cluster of generic skills. The present study aimed to reveal the relation between teaching cluster and learning outcomes.

Then, the regression modeling revealed that different teaching units or clusters showed different educational effects on each learning outcome. Society 5.0 Conception of Education was related with teaching units belonged to generic skill, in concrete, Lecture on education and Data Science. Course goal (conventional goal) and Society 5.0 Improvement of Education were not influenced by teaching clusters. For Society 5.0 Conception of Education, interaction term (professional skill × generic skill) was significant. The level of Conception of Education was kept in higher level for respondents who perceived the higher level of the depth of learning from the teaching cluster of generic skill, even when whether they felt the less depth of learning from the cluster of professional skill. In contrast, in the sample with relatively lower levels of learning from the

generic skill cluster, the higher the learning of professional skill, the lower the level of acquisition of Conception of Education. In other words, the orientation to acquire only professional skill as teacher prevented from or deprived of students' learning chances to get the sense of Conception of Education.

Analysis 2

The present analysis investigated whether the learning outcomes of the practical seminar for teachers changed depending on the motivations or orientations for a teacher (reason to be a teacher) and period of teaching aspirations.

Method

Respondents and procedure

Fifty-five responded same as analysis 1 to the questionnaire through a web survey.

Items

Period of teaching aspirations: Asking "When did you start to pursue a career in teaching?" and respondents selected one option among 1) elementary school, 2) junior high school, 3) high school, and 4) university.

Reason to be a teacher: "How well does each of the following apply to your motivation for becoming a teacher?" and following items were shown: "I can help children grow," "I can interact with children," I will be able to take classes and lessons fun, "I think I can grow as a person," "I

can work at a school," "I will be able to interact with a variety of people," "I will be able to convey the beauty of the subject matter," "I can be in a position to teach others," I can contribute to the world," "I can lead a club or club activities," and "I will be able to utilize my expertise and strengths" (Yamaguchi et al., 2010). Responding through "1 not applicable" to "5 applicable."

The abilities for Society 5.0 as a teacher: the same 8 items as analysis 1 and Likert-scale were applicated.

Course goal: the same 4 items as analysis 1 and Likert-scale were applicated.

Analysis

To reveal factor structure of Reason to be a teacher, factor analysis was performed on 4 items of Reason to be a teacher. And to reveal the relation between Reason to be a teacher and learning outcomes (The abilities for Society 5.0 as a teacher and Course goal), regression analysis was performed. Specifically, the effects of interaction term between Period of teaching aspiration × Reason to be a teacher on learning outcomes was modeled.

Results

The relation between the period of teaching aspirations and Gender

Fifty-five respondents answered the questions and Table1 showed the Period of teaching aspirations sliced by Gender (Table7). Frequencies were significantly biased among cells (χ^2 (2, N=55) =4.982, p <.10 CV=.−301).

Table 7 Cross-table between Gender and Period of teaching aspirations

	Periods of teaching asporations			Sum
	Junior high school	High school	University	
Male	▽5	18	10	33
Female	▲9	7	6	22
Sum	14	25	16	55

Note ▲ and ▽ represented the results of residual analysis. ▽ indicated that the cell has significantly fewer measured frequencies than expected frequencies. ▲ indicated that the cell ahs signficantly more measured frequencies than expectied frequencies.

Item analysis of Reason to be a teacher

Principal component analysis with Promax rotation suggested a two-factor solution (Table8). The first factor was named "Teaching oriented" because the factor consisted of such items as "I can lead a club or club activities," and "I can come into contact with a variety of people." The second factor was named "Development oriented" because the factor consisted of such items as "I will grow as a person," and "I will be able to help children grow."

The relation between the period of teaching aspirations and reason to be a teacher

Scale scores of Reason to be a teacher did not differ among Period of teaching aspirations (period of teaching aspirations (3: between): $F(2, 50) = 0.804$, $p = .453$, $\eta^2_p = .031$; reason to be a teacher (2: within): $F(1, 50) = 0.258$, $p = .614$, $\eta^2_p = .005$; interaction term: $F(2, 50) = 0.372$, $p = .691$. $\eta^2_p = .015$) (Figure3).

Table 8 Pattern matrix on Reason to be a teacher

Items	Factor		h^2
	1	2	
I can lead a club or club activities.	.78	-.44	.56
I can come into contact with a variety of people.	.73	-.01	.53
I can work in a school.	.60	.07	.39
Be able to interact with children	.52	.31	.48
I can contribute to the world.	.49	.18	.34
I can be in a position to teach others.	.49	.29	.42
I will be able to grow as a person.	-.15	.75	.51
I will be able to convey the beauty of the subject matter	-.05	.72	.50
I will be able to make classes and lessons fun	.12	.68	.54
I will be able to help children grow.	.20	.59	.47
Factor Contribution	2.71	2.71	

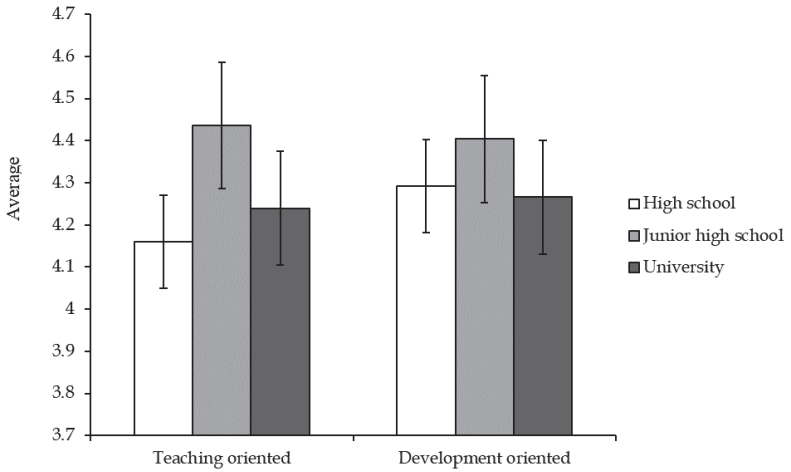

Figure 3 Comparisons of Reason to be a teacher among Period of teaching aspirations

Regression modeling in which Course goal, Conception, and Improvement were entered as a response variable, a reason to be a teacher (Teaching oriented and Development oriented), and dummies Period of teaching aspirations (reference variable was Junior high school) was entered as an exploratory variable

In the model of Table9, interaction terms Teaching oriented × High school/University were also entered. Modeling revealed that Development oriented enhanced Conception (β =.39. p <.05) and Improvement (β =.42. p <.01). Interaction term Teaching oriented × High school reached a marginally significant level (β =−.35, p <.10) for Course goal. Simple slop analysis (Figure4) revealed that in High school −1SD Teaching oriented showed β =.43, SE=0.259, p <.10, on the other hand, in High school +1SD,

Table 9 Regression modeling in which Course goal, Conception and Improvement entered as a response variable, Reason to be a teacher (Teaching oriented and Development oriented) and dummies Period of teaching aspirations (reference variable was Junior high school), and interaction terms Teaching oriented × High school and Teaching oriented × University were entered an exploratory variable

Pridictor	Conception	Improvement	Course goal
Teaching oriented	.00	.02	.08
Development oriented	.39 *	.42 **	.16
High school	−.03	.19	.01
University	−.07	.10	−.22
Teaching oriented × High school	−.30	−.30	−.35 +
Teaching oriented × University	−.15	−.27	−.20
R^2	.23 **	.23 **	.18 **

$^{**}p < .01$, $^{*}p < .05$, $^{+}p < .10$

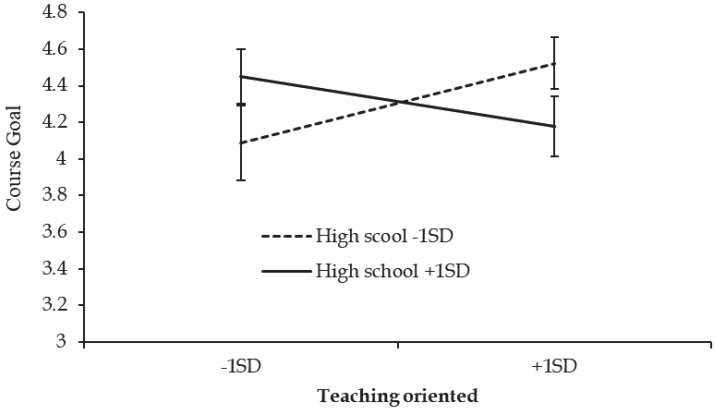

Figure 4　Simple slop analysis of the effects of High school × Teaching oriented on Course goal

Teaching oriented showed no significant β.

In the model of Table10, interaction terms Development oriented × High school/University were entered. Modeling revealed that Development oriented enhanced Conception (β =.43, p <.05) and Improvement (β =.44, p <.05) significantly. For Course goal, interaction term Development × University reached a significant level (β −.32, p <.10), and simple slop analysis (Figure5) revealed that in University −1SD, Development oriented showed a significant β on Course goal β =.512, p=.04, SE=0.215, on the other hand, in University +1SD, Development oriented did not show a significant β on Course goal β =−.069, p=.74, SE=0.186.

Table 10　Regression modeling in which Course goal, Conception and Improvement entered as a response variable, Reason to be a teacher (Teaching oriented and Development oriented) and dummies Period of teaching aspirations (reference variable was Junior high school), and interaction terms Development oriented × High school and Development oriented × University were entered an exploratory variable

変数名	Conception	Improvement	Course goal
Teaching oriented	−.01	−.01	.07
Development oriented	.43 **	.44 **	.22
High school	−.07	.13	−.02
University	−.14	.01	−.29
Development oriented × High school	.10	.02	−.17
Development oriented × University	−.06	−.10	−.32 +
R^2	.20 **	.19 **	.18 **

$^{**}p < .01$, $^{*}p < .05$, $^{+}p < .10$

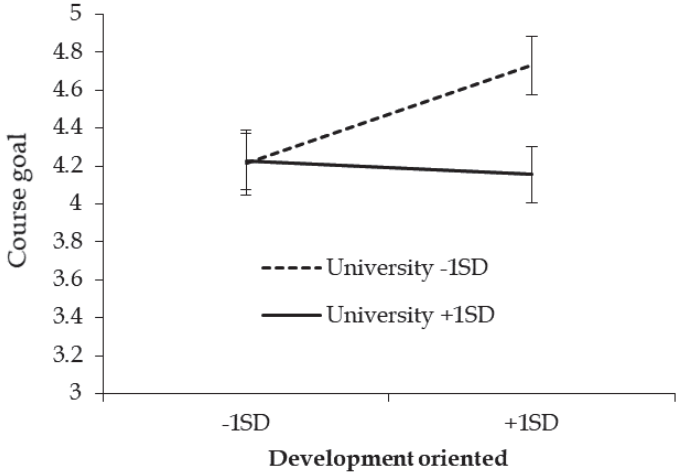

Figure 5　Simple slop analysis of the effects of University × Development oriented on Course goal

Discussion

The present study investigated whether a period of teaching aspirations and reason to be a teacher influenced the learning outcomes in the practical seminar for a teacher.

The reason to be a teacher showed two aspects of "Teaching oriented" and "Development oriented." The score averages of Teaching and Development did not differ among the period of teaching aspirations.

Regression analysis revealed that of two factors of reason to be a teacher "Development oriented" was positively related with "Conception" and "Improvement" while "Teaching oriented" did not related with three learning outcomes at all. Those results suggested that for acquiring the skills or abilities for Society 5.0 as a teacher, the educational vision "teacher should teach subjects" would be inappropriate or inadequate, and the educational vision "teacher should develop themselves as well as the children" would be much more adaptive.

Next, we examined how the timing and motivation for applying to the teaching profession interacted to influence learning outcomes in the practical seminar for a teacher. The analyses suggested that in the case that students start to pursue a career in teaching from junior high school, the stronger the students had the orientation for Teaching or Development, the deeper the students learned the contents belonged to Course goal while the positive relation between teaching aspirations and course goal was not shown in the case that students start to pursue a career in teaching from high school or university. It would be that the shorter the period of aspirating teaching was, the weaker the relationship between the strength of reason to be a teacher and the achievement shown

in the course goal is.

Analysis 3

The present analysis investigated how teaching cluster and Reason to be a teacher influenced on learning outcomes. Specifically, the effect of interaction term Teaching cluster × Reason to be a teacher on learning outcomes was focused.

Results

In order to shorten the expression, the following expression shall be used. Society 5.0 Conception of Education was represented with simply "Conception", Society 5.0 Improvement of Education was represented with simply "Improvement", Teaching cluster of profession skill was simply replaced with "Profession skills", Teaching cluster of generic skill was replaced with "Generic skills" in analysis 3.

Regression analyses were performed: learning outcomes (Conception, Improvement and Course goal) were entered into model as response variables and two teaching cluster and two factors of reason to be a teacher and some interaction terms were entered into model as explanatory variables.

Correlation matrix

Correlations between two teaching cluster, two factors of Reason to be a teacher and learning outcomes were shown in Table11.

Table 11 Correlation matrix between two teaching cluster, two factors of Reason to be a teacher and learning outcomes

	Course goal	Conception	Improvement
Teaching cluster			
Profession skills	.18	.04	.30 *
Generic skills	.15	.35 *	.28 *
Reason to be a teacher			
Teaching oriented	.14	.17	.14
Development oriented	.24 +	.41 **	.43 **

** $p < .01$, * $p < .05$, + $p < .10$

Model 1 : interaction terms were Profession skills × Teaching oriented and Generic skills × Teaching oriented

As main effect, Development oriented showed positive effect on Improvement (β =.390, p <.05). The interaction term of Generic skills × Teaching oriented showed significant effect (β =.468, p <.01). As simple slope analysis, when Teaching oriented was −1SD, Generic skills showed no significant effect on Conception (β =−.383, p=.193). When Teaching oriented was +1SD, Generic skills showed significant effect on Conception (β =731, p=.001).

Model 2 : interaction terms were Profession skills × Development oriented and Generic skills × Development oriented

As main effect, Development oriented showed positive effect on Improvement (β =.385, p <.05). The interaction term of Profession skills × Development oriented was significant (β =.488, p <.01), and of Generic skills × Development oriented was significant (β =−.438, p <.05). As

Table 12 Results of Model 1

Predictor	Conception	Improvement	Course goal
Teaching cluster			
Profession skills	−.10	.20	.16
Generic skills	.17	.03	−.06
Reason to be a teacher			
Teaching oriented	.07	−.04	.08
Development oriented	.26 +	.39 *	.15
Interaction term			
Profession skills × Teaching oriented	−.24	−.02	.02
Generic skills × Teaching oriented	.47 **	−.06	.11
R^2	.37 **	.22 +	.08

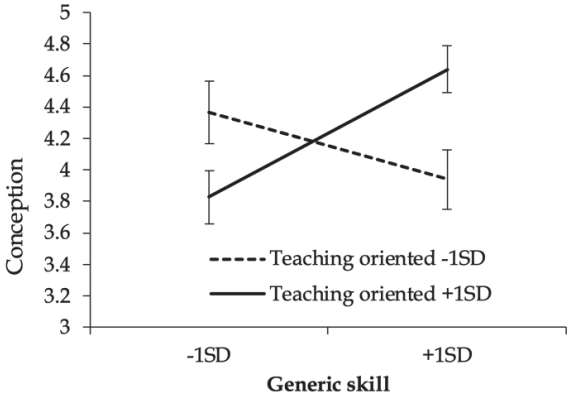

Figure 6 Simple slop analysis for interaction term of Generic skills × Teaching oriented on Conception

simple slop analysis for Profession skills × Development oriented, when Development oriented was −1SD, Profession skills showed significant effect on Conception (β =−.404, p=.022). When Development oriented was +1SD,

Table 13 Results of Model 2

Predictor	Conception	Improvement	Course goal
Teaching cluster			
Profession skills	-.01	.21	.16
Generic skills	.03	.04	-.05
Reason to be a teacher			
Teaching oriented	.21	-.06	.14
Development oriented	.24	.49 *	.10
Interaction term			
Profession skills × Development oriented	.49 **	.01	.18
Generic skills × Development oriented	-.44 *	.04	-.04
R^2	.36 **	.22 +	.09

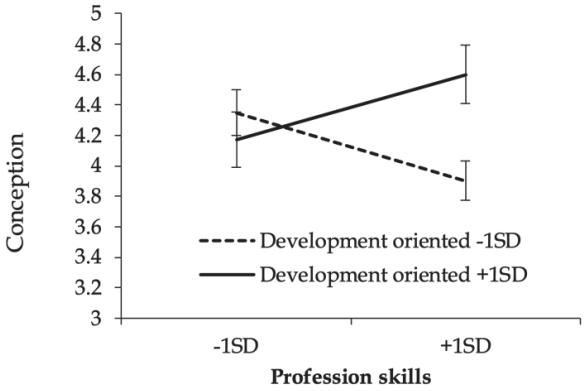

Figure 7 Simple slope analysis for interaction term of Profession skills × Development oriented on Conception

Profession skills showed no significant effect on Conception (β =.390, p=.145). As simple slop analysis for Generic skills × Development oriented, when Development oriented was -1SD, Generic skills showed significant

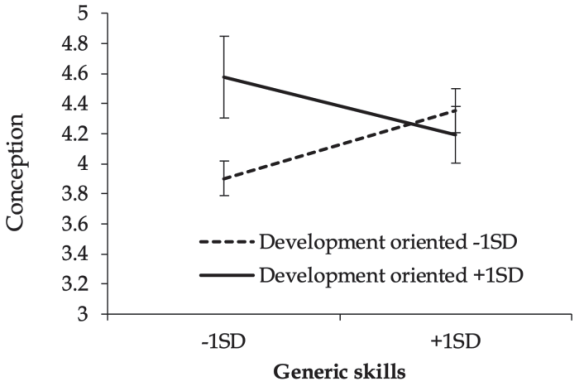

Figure 8　Simple slope analysis for interaction term of Generic skills × Development oriented on Conception

effect on Conception（β =.403, p=.012）. When Development oriented was + 1SD, Generic skills showed no significant effect on Conception（β =−.347, p=.341）.

Discussion

Based on regression modeling, main effect was significant from Development oriented to Improvement. For three tyles of learning outcomes, two Teaching clusters and Teaching oriented of Reason to be a teacher did not show significance. As main effect, only Development oriented was significant.

For Conception as learning outcomes, some interaction term between Reason to be a teacher and Teaching cluster showed significance. Broadly speaking, Development oriented（not Teaching oriented）and Generic skills（not Profession skills）were bottoming out Conception. As Figure8,

when orientation for Development was weak and preference for Profession skills was strong, the levels of Conception was the weakest. As Figure8, when orientation for Development was strong, preference for Generic skills was not needed for the promotion of Conception.

General discussion

Three analyses suggested that to develop teachers' abilities needed in schools under the context of Society 5.0, 1) among teaching cluster, the cluster which treated Generic skills (not Profession skills) facilitated the acquisition of the needed teachers' abilities, 2) among factors of Reason to be a teacher, the orientation for Development (not Teaching) facilitated the acquisition of the needed teachers' abilities, and 3) as for the interaction Teaching cluster × Reason to be a teacher, as an approximate trends, the teaching unit of Generic skills and the orientation for Development facilitated the acquisition of the needed teachers' abilities.

Paradoxically, the preset study suggested, unit structure of the practical seminar for teachers should be improved to the direction of preparing or increasing the units which train students' generic skills in order to develop teacher competencies for education based on Society 5.0. It would be valuable to incorporate learning programs developed for fostering generic skills into courses for teaching. Perhaps it would be effective to take a teaching class in the style of PBL or in the manner of data science course.

In the future, the validation of the measurement for the qualities of teacher required in Society5.0 of the present study should be checked with subsequent studies and it would be desirable that the items or indexes for the teachers qualities should be developed empirically and inductively.

How should the practical seminar for a teacher be improved to develop teachers who are suitable for Society 5.0 schools? First, throughout the class, we should convey that the teacher's main duty is to "promote growth" rather than "teach." Secondly, it should be important to prepare teaching units that were effective both on developing students' orientation to develop (not teach to) children and themselves and on promoting the acquisition for such teacher skills required for Society 5.0 school as a teacher as shown in 中央教育審議会 (2020) at the same time.

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