

松 山 大 学 論 集
第 31 卷 第 1 号 抜 刷
2 0 1 9 年 4 月 発 行

Problem-Based Learning
for Economic Issues in Ehime Prefecture

Eiji Takeda

Problem-Based Learning for Economic Issues in Ehime Prefecture

Eiji Takeda

Abstract

This study's objective was to verify the types of cognitive skills students are able to develop through Problem-Based Learning.

I taught the following courses at the Matsuyama University Faculty of Economics : *Ehime Prefecture : Economy and Issues 2018* and *Matsuyama City : Economy and Issues 2018*. This study shows that through those courses, students' cognitive skills (problem-solving skills and critical thinking) and non-cognitive skills (independence) became intertwined as they developed.

Keyword

Problem-Based Learning, Problem Solving Skills, Critical Thinking Cognitive Skills, Self-Directed Learning

Contents

1. Objectives and significance of research
 2. Summary of prior research
 - 2.1. Prior research on developmental phases and non-cognitive skills
 - 2.2. Prior research in Japan on cognitive skills
 - 2.3. Prior research on Problem-Based Learning
 3. Verification method
 4. Results of verification
 5. Discussion
 6. Conclusion
- Postscript
References

1. Objectives and significance of research

What are the effects of Problem-Based Learning ?¹⁾ What types of cognitive skills have students cultivated through Problem-Based Learning ?²⁾ The objective of this study is to verify the types of cognitive skills that students cultivated through the Problem-Based Learning courses I taught at the Matsuyama University Faculty of Economics : *Ehime Prefecture : Economy and Issues 2018* (second semester, 2 credits) and *Matsuyama City : Economy and Issues 2018* (first semester, 2 credits). In these two courses, students use economic theories to examine economic issues faced by outside lecturers in Ehime Prefecture. The initiatives they have taken to solve the economic issues in specific regions, as well as their results, can contribute to the discussion of “rural development initiatives by universities” (MEXT Bureau of Higher Education 2016).

2. Summary of prior research

2.1. Prior research on developmental phases and non-cognitive skills

According to Ochanomizu University (2016), in Japan, non-cognitive skills are considered to be “social-affective skills such as perseverance, self-control, and self-respect.” Even within Japan, there are discussions about developing non-cognitive skills through early childhood education. The MEXT Central Council for

1) Problem-Based Learning and Project-Based Learning are pedagogical methods that developed within medical and engineering education, respectively. Yuasa, Ōshima, and Ōshima (2011) suggested that “in Project-Based Learning, the results of the project occupy a large share of the learning goals, so more emphasis is placed on the *application* of knowledge, while in Problem-Based Learning, greater weight is placed on the learning cycle, so more emphasis is placed on the *acquisition* of new knowledge” (p. 19). Yuasa et al. (2011) further conclude “in Problem-Based Learning, the learning process is clearly defined, whereas in Project-Based Learning, the process is left up to individual’s implementation” (p. 15).

2) The difference between “Cognitive Abilities” and “Cognitive Skills” has not been clarified in existing research in Japan, so this study uses “Cognitive Skills.”

Education's Early Childhood Education Subdivision (2016) stated that the level of "non-cognitive skills" acquired in early childhood supports healthy and advanced development from schooling through adulthood. The council has also discussed the importance of cultivating emotions, ambitions, and behaviors through early childhood education. Institutions of higher education also grapple with the question of how to plan the development and assessment of students' non-cognitive skills in educational programs in higher education.

Table 1 provides an overview of the non-cognitive skills advocated by MEXT ; the Cabinet Office ; the Ministry of Economy, Trade and Industry ; the Ministry of Health, Labour and Welfare ; and the OECD, by developmental stage, according to the Japan Institute of Lifelong Learning (2018).

Table 1 : Non-cognitive skills required at each developmental stage

| Developmental stage | Names of non-cognitive skills |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Early childhood | (1) The three core qualities/skills that we want to develop in early childhood education |
| Compulsory education | (1) <i>Ikiru chikara</i> (zest for living) (2) Career education (3) A subset of <i>shakaijin kiso-ryoku</i> (basic work skills) |
| Secondary education | (1) <i>Ikiru chikara</i> (zest for living) (2) Career education (3) <i>Shūshoku kiso-ryoku</i> (basic skills for finding a job) |
| Higher education | (1) <i>Gakushi-ryoku</i> (the skills, knowledge, and attitude gained through an undergraduate education) (2) <i>Shūshoku kiso-ryoku</i> (basic skills for finding a job) (3) The ability to cultivate talent demanded by graduate schools (4) The ability to seek challenge |
| Future self | (1) Career education (2) <i>Ningenryoku</i> (the ability to live as an independent adult in society) (3) <i>Shakaijin kiso-ryoku</i> (basic work skills) (4) Key competencies |

Source : Japan Institute of Lifelong Learning (2018) p. 7, Table 6.

Heckman (2013) noted that fostering perseverance, cooperation, planning skills, and other non-cognitive skills in early childhood, before the child starts school, is important to both develop their cognitive skill and maximize their opportunities later in life. In the meantime, “while ambition and interest have been particularly valued in Japan, the development of important elements of non-cognitive skills, such as persistence and the thirst for challenge, has not been emphasized as much” (Mutō 2016, p. 19). In Japan, “the understanding of cognitive skills and non-cognitive skills as things that become intertwined as they develop has been weak” (Mutō 2016, p. 19).

2. 2. Prior research in Japan on cognitive skills

Table 2 shows the cognitive and non-cognitive skills described by the Japan Institute of Lifelong Learning (2018). Cognitive skills are (1) basic learning skills, (2) basic knowledge / technical skills, and (3) specialization / expertise. Non-cognitive skills are (a) problem-solving skills, (b) critical thinking, (c) cooperation, (d) communication skills, (e) independence, (f) self-control, (g) self-affirmation,

Table 2: Cognitive and non-cognitive skills

| Cognitive skills | 1 Basic learning skills | 2 Basic knowledge / technical skills | 3 Specialization / expertise |
|----------------------|---------------------------|--------------------------------------|------------------------------|
| Non-cognitive skills | a. Problem-solving skills | b. Critical thinking | c. Cooperation |
| | d. Communication skills | e. Independence | f. Self-control |
| | g. Self-affirmation | h. Ability to get things done | i. Leadership skills |
| | j. Creativity | k. Curiosity | l. Empathy |
| | m. Sense of morality | n. Sense of ethics | o. Awareness of norms |
| | p. Civic sense | | |

Source : Japan Institute of Lifelong Learning (2018), p. 5, Table 4.

(h) ability to get things done, (i) leadership skills, (j) creativity, (k) curiosity, (l) empathy, (m) sense of morality, (n) sense of ethics, (o) awareness of norms, and (p) civic sense. Problem-solving skills and critical thinking are sometimes included in both cognitive and non-cognitive skills.

The classification of cognitive and non-cognitive skills in this study comes from Woods (1994), who stated that the skills used in problem-solving are based on “discipline experience knowledge” and “discipline knowledge structure,”. I interpret this to mean that problem-solving skills and critical thinking must be based on basic learning skills, basic knowledge / technical skills, and specialization / expertise as they relate to economics.

2.3. Prior research on Problem-Based Learning

According to Woods (1994), in Subject-Based Learning, students are first taught knowledge, after which they acquire that knowledge, and then they are given problems for the application of that knowledge. Next, they reflect on the knowledge they have been taught. Meanwhile, in Problem-Based Learning, a problem is posed to students, after which they identify the knowledge, they need to solve it, and then acquire that knowledge. Finally, they return to the problem that was originally posed and apply to it the knowledge they learned.

Hmelo-Silver (2004) presents similar findings to Woods (1994). In Hmelo-Silver (2004)'s “Problem-Based Learning Cycle,” students are first given real-world *problems/scenarios*, and then they *identify facts, generate hypotheses, and formulate and analyze problems*. After that, they *identify knowledge deficiencies and apply new knowledge*. This is self-directed learning. Finally, they *abstract* their newly acquired knowledge from the real-world problem.

3. Verification method

I designed the Matsuyama University Faculty of Economics courses *Ehime Prefecture : Economy and Issues 2018* (second-year students, 2 credits, Table 3) and *Matsuyama City : Economy and Issues 2018* (first-year students, 2 credits, Table 4), based on Hmelo-Silver's (2004) Problem-Based Learning Cycle.

In the Matsuyama University Faculty of Economics, each lecture session of *Ehime Prefecture : Economy and Issues 2018* and *Matsuyama City : Economy and Issues 2018* would start with me presenting the problem (10 minutes). Next, an outside lecturer would speak about an economic issue he or she faced in Ehime Prefecture and the current situation with regard to that issue (45 minutes). Then, students would identify facts and generate hypotheses in order to formulate and analyze problems (15 minutes). After that, students would be divided in groups of three and allotted time for Cooperative Learning, in which they discussed the facts and hypotheses they identified (10 minutes).³⁾ Finally, as a means of reflection support for the students, I would present the knowledge (regional economic theories) I wanted them to use (10 minutes).⁴⁾ Identifying knowledge deficiencies, applying new knowledge, and abstracting the new knowledge to economic issues in Ehime Prefecture is *self-directed learning*. I decided during the first lecture that I would engage in self-directed learning with the students outside of class.

For this study, I will verify whether students acquired the knowledge they were

3) According to Johnson, et al. (1984), "Educational activities where students work together to learn from each other, realize the significance of doing so, develop their ability to cooperate with others, and internalize those values" (p.224 in the Japanese translation) is Cooperative Learning.

4) Building a learning program "where teachers do not pull students up to reach Attainment Objectives, but rather students (using the skills they already have) think more deeply and enrich their own intellectual structure with regard to a given task" (Furukawa 2017, p. 19) is "Reflection Support" in higher education.

Table 3: Problems posed, facts presented, and knowledge to be acquired in *Ehime Prefecture : Economy and Issues 2018*

| Lecture | Issue | Facts presented by | Knowledge to be acquired |
|---------|----------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------------------|
| 1 | Economy and issues in Ehime Prefecture, where population is declining | Course lecturer | |
| 2 | (Reflection support / abstraction support) | Course lecturer | |
| 3 | Use regional economic theories to discuss HIKARI's location. | HIKARI Group | Weber's theory of industrial location |
| 4 | Use regional economic theories to discuss Imabari Towel's industrial advantage. | Imabari Towel Industrial Association | Ricardo's theory of comparative advantage |
| 5 | Use regional economic theories to discuss Yamaki's location. | Yamaki Co., Ltd. | Weber's theory of industrial location |
| 6 | Use regional economic theories to discuss the population distributions of Matsuyama City and Tō'on City. | Tō'on City Industrial Development Division | Burgess concentric zone model |
| 7 | Use regional economic theories to discuss Tobeyaki's industrial advantage. | Tobeyaki Group | Ricardo's theory of comparative advantage |
| 8 | Use regional economic theories to discuss the decrease in Tobeyaki's industrial advantage. | Course lecturer | Government failures and market failures |
| 9 | Use regional economic theories to discuss the advantage of the aquaculture industry in Southern Ehime. | Ehime Prefecture Fisheries Administration Division | Ricardo's theory of comparative advantage |
| 10 | Use regional economic theories to discuss the advantage of citrus agriculture in Ehime. | Ehime Prefecture Agriculture Administration Division | Ricardo's theory of comparative advantage |
| 11 | Use regional economic theories to discuss Ehime Prefecture's industrial development policies. | Ehime Prefecture Industrial Policy Division | Economies of agglomeration |
| 12 | Use regional economic theories to discuss Ehime Prefecture's policies to counteract population decline. | Ehime Prefecture Bureau of Policy Planning | Population movement model |
| 13 | Use regional economic theories to discuss Iyo Bank's policies for developing the shipbuilding industry. | Iyo Bank Rural Development Division | Ricardo's theory of comparative advantage |
| 14 | Group work : "Differences between metropolises and regional cities" (reflection support / abstraction support) | Course lecturer | |
| 15 | Group work : "Regional industries and companies" (reflection support / abstraction support) | Course lecturer | |

Source : Created by the author based on the 2018 Matsuyama University Faculty of Economics syllabus.

Table 4: Problems posed, facts presented, and knowledge to be acquired in *Matsuyama City: Economy and Issues 2018*

| Lecture | Issue | Facts presented by | Knowledge to be acquired |
|---------|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------------|
| 1 | Economy and issues in Matsuyama City, where population is declining | Course lecturer | |
| 2 | Use regional economic theories to discuss factors in the decline of movement in and out of Matsuyama City | Matsuyama City General Planning and Strategy Division | Population movement model |
| 3 | Use regional economic theories to discuss factors for the decrease of business sites in Matsuyama City | Matsuyama City Rural Economy Division | Transaction cost |
| 4 | Use regional economic theories to discuss SAGAWA PRINTING's transactions with other companies | SAGAWA PRINTING | Ricardo's theory of comparative advantage |
| 5 | Use regional economic theories to discuss MIURA Co.'s location strategy | MIURA Co., Ltd. | Weber's theory of industrial location |
| 6 | (Reflection support / abstraction support) | Course lecturer | |
| 7 | Use regional economic theories to discuss Matsuyama City's policies for increasing its gross product. | Cybozu, Inc. | Improving productivity of labor |
| 8 | | Nankai Broadcasting Co., Ltd | Policies for increasing the number of workers (current) |
| 9 | | FUJI Co., Ltd. | Policies for increasing the number of workers (future) |
| 10 | (Reflection support / abstraction support) | Course lecturer | |
| 11 | Use regional economic theories to discuss the migration/settlement policies of Matsuyama City. | Matsuyama City City Promotion Division | Interests of urban residents |
| 12 | Use regional economic theories to discuss the migration / settlement policies of a private company. | SWITCH COMPANY | Economic externalities of urban agglomeration |
| 13 | Use regional economic theories to discuss the migration / settlement policies of a public company. | Ehime Young Talent Development Promotion Organization | Non-economic externalities of urban agglomeration |
| 14 | (Reflection support / abstraction support) | Course lecturer | |
| 15 | Presentation of proposals to solve the problem (abstraction) "My policy to deal with Matsuyama City's population decline" | Course lecturer | |

Source: Created by the author based on the 2018 Matsuyama University Faculty of Economics syllabus.

lacking (regional economic theories), based on the number of correct answers they had on the same set of the problems posed to them after Lecture 1 and Lecture 15.

4. Results of verification

Tables 5 and 6 show whether students were able to examine their knowledge deficiencies (regional economic theories) to acquire the knowledge in which they were deficient. The sub-skills under “Problem-solving skills” in Tables 5 and 6 are based on Woods (1994) and show the learning rate (proportion of correct answers) on problems about regional economic theories, the academic knowledge in question.

Ricardo’s theory of comparative advantage was the theory with the highest learning rate (proportion of correct answers) in “Cognitive Skills > Problem-solving skills” as shown in Table 5. This theory was featured in five out of the 15 lectures. Among regional economic theories, Ricardo’s theory of comparative advantage is most relevant to the continuation of local industry in Ehime Prefecture. Students used it to generate hypotheses, verify those hypotheses using statistical data, and think independently to propose solutions with regard to the economic issues faced by Imabari Towel Industrial, the Tobeyaki Group, the Southern Ehime aquaculture industry, Ehime citrus agriculture, and the Imabari shipbuilding industry (Lectures 4, 7, 9, 10, and 11 respectively). With regard to applying and abstracting the regional economic theory, students took approximately 2 hours after each lecture to engage in self-directed learning. Students were also supposed to engage in self-directed learning with regard to *the four-stage theory of urban growth* and *the interests of urban residents*, which were not covered in the course.

The learning rates (proportions of correct answers) for “Cognitive skills > Problem-solving skills” shown Table 5 increased significantly as follows: *Change in population of Ehime Prefecture* increased from 9% (Lecture 1) to 87% (Lecture 15); *Number of people moving in and out of Ehime Prefecture* increased from 3%

(Lecture 1) to 51% (Lecture 15; and *Minimum wage differential* increased from 9% to 65%. It can be said that students developed their objective (statistics-based) critical thinking in such areas as simple data literacy and the ability to analyze statistical data.

What is noteworthy in Table 5 is the fostering of the non-cognitive skill “independence.” In July 2018, Ehime Prefecture experienced torrential rainfall due to Typhoon No. 7 and the seasonal rain front, which caused extensive damage to citrus crops and houses. I would like to focus on the fact that the number of people

Table 5: Learning rates for regional economic theories in *Ehime Prefecture: Economy and Issues 2018* (results of the confirmation tests)

| | | | After Lecture 1 (n = 116) | | | | After Lecture 15 (n = 87) | | | |
|----------------------|------------------------|-------------------------------------------------------------------------------------------------------|---------------------------|----|-----------|------|---------------------------|-----|-----------|-----|
| | | | Correct | | Incorrect | | Correct | | Incorrect | |
| Cognitive skills | Problem-solving skills | Population movement model | 3 | 3% | 113 | 97% | 55 | 64% | 31 | 36% |
| | | Concentric zone model | 0 | 0% | 116 | 100% | 63 | 73% | 23 | 27% |
| | | Four-stage theory of urban growth* | 0 | 0% | 116 | 100% | 24 | 28% | 62 | 72% |
| | | Interests of urban residents* | 2 | 2% | 114 | 98% | 4 | 5% | 82 | 95% |
| | | Economics of agglomeration | 4 | 3% | 112 | 97% | 54 | 63% | 32 | 37% |
| | | Theory of comparative advantage | 5 | 4% | 111 | 96% | 75 | 87% | 11 | 13% |
| | | Theory of industrial location | 3 | 3% | 113 | 97% | 50 | 58% | 36 | 42% |
| | Critical thinking | Change in population of Ehime Prefecture | 11 | 9% | 105 | 91% | 75 | 87% | 11 | 13% |
| | | Number of people moving in and out of Ehime Prefecture | 3 | 3% | 113 | 97% | 44 | 51% | 42 | 49% |
| | | Minimum wage differential | 11 | 9% | 105 | 91% | 56 | 65% | 31 | 36% |
| Non-cognitive skills | Independence | Participation as disaster-relief volunteers or in post-disaster rebuilding events in Ehime Prefecture | 2 | 2% | 114 | 98% | 43 | 50% | 43 | 50% |

Source: Created by the author from the results of tests given after the first and final lectures in *Ehime Prefecture: Economy and Issues 2018* at the Matsuyama University Faculty of Economics.

Note 1: The confirmation tests were given after Lectures 1 and 15, covering all 11 topics, with a time limit of 180 minutes. The mean times required to complete the tests were 11 minutes in the Lecture 1 test and 87 minutes in the Lecture 15 test.

Note 2: Asterisks denote regional economic theories that were not covered in the course.

Table 6 : Learning rates for regional economic theories in *Matsuyama City : Economy and Issues 2018* (results of the confirmation tests)

| | | | | | | | | | | |
|------------------|------------------------|------------------------------------------------------------|----|-----|-----|-----|-----|-----|-----|-----|
| Cognitive skills | Problem-solving skills | Population movement model | 12 | 7% | 170 | 93% | 39 | 30% | 89 | 70% |
| | | Interests of urban residents | 3 | 2% | 179 | 98% | 23 | 18% | 105 | 82% |
| | | Central place theory | – | – | – | – | 57 | 45% | 71 | 55% |
| | | Economics of agglomeration | 9 | 5% | 173 | 95% | 105 | 82% | 23 | 18% |
| | | Theory of comparative advantage | 12 | 7% | 170 | 93% | 78 | 61% | 50 | 39% |
| | | My policy to deal with Matsuyama City's population decline | – | – | – | – | 71 | 55% | 57 | 45% |
| | Critical thinking | Population of Matsuyama City | 33 | 18% | 149 | 82% | 95 | 74% | 33 | 26% |
| | | Movement in and out of Matsuyama City | 16 | 9% | 166 | 91% | 100 | 78% | 28 | 22% |
| | | Number of business sites in Matsuyama City | 12 | 7% | 170 | 93% | 87 | 68% | 41 | 32% |

Source : Created by the author from the results of tests given after the first and final lectures in *Matsuyama City : Economy and Issues 2018* at the Matsuyama University Faculty of Economics.

who volunteered in disaster-relief activities or in post-disaster rebuilding events during / after the “July 2018 downpour in Ehime” increased from 2 (Lecture 1) to 43 (Lecture 15). This suggests that after taking *Ehime Prefecture : Economy and Issues 2018*, students tended to exhibit a greater fondness for their hometown.

From all of the above, it can be observed that through the process of acquiring the cognitive skills “problem-solving skills” and “critical thinking,” students also developed the non-cognitive skill “independence.” This study was able to confirm the finding by Heckman (2013) and Mutō (2016) that cognitive skills and non-cognitive skills become intertwined as they develop.

The problem-solving proposals created by students were handed to their respective outside lecturers as “rural development initiatives by universities” (Ministry of Education, Culture, Sports, Science and Technology Bureau of Higher Education 2016). Students used regional economic theories to devise proposals to solve the economic issues faced by the outside lecturers in Ehime Prefecture and

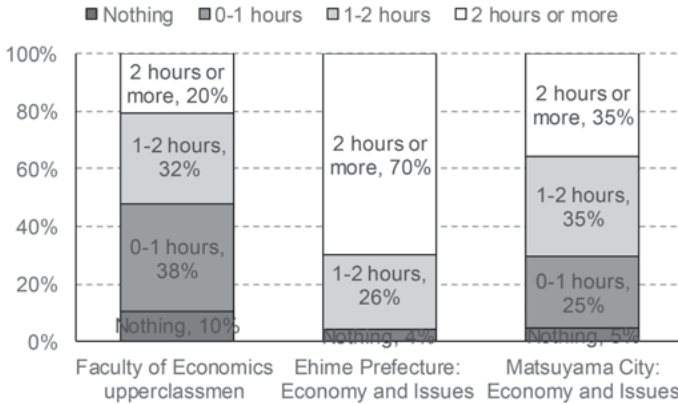
shared their proposals with the lecturers. This is the distinctive feature of the courses I designed, *Ehime Prefecture : Economy and Issues 2018* and *Matsuyama City : Economy and Issues 2018*, which combine Problem-Based Learning and reflection support.

5. Discussion

Fig.1 shows the differences in the total weekly self-directed learning time between students in *Ehime Prefecture : Economy and Issues 2018* ($n=97$), *Matsuyama City : Economy and Issues 2018* ($n=146$), and upperclassmen at the Matsuyama University Faculty of Economics in 2017 ($m=375$).⁵⁾ The most common total weekly self-directed learning time of upperclassmen in 2017 was less than 1 hour (38%), followed by 1 to 2 hours (32%). Meanwhile, the most common amount of time students in *Ehime Prefecture : Economy and Issues 2018* reported they spent per week studying at home was more than 2 hours (70%), followed by 1 to 2 hours (27%). This shows that more students in *Ehime Prefecture : Economy and Issues 2018* spent 2 or more hours on self-directed learning, compared to general upperclassmen. Comparing the weekly home-study time per student in *Ehime Prefecture : Economy and Issues 2018* (second-semester offering) and *Matsuyama City : Economy and Issues 2018* (first-semester offering) shows that more students in *Ehime Prefecture : Economy and Issues 2018* (second-semester offering) spent 2 or more hours per week studying at home. There is a

5) *Ehime Prefecture : Economy and Issues* was designed for second-year students (new curriculum), but for the 2018 edition, it was offered as part of “Regional Policy” (old curriculum) for third-year students. *Matsuyama City : Economy and Issues* was designed for first-year students (new curriculum), but for the 2018 edition, it was offered as part of “Regional Industry” (old curriculum) for third-year students. Both courses were taken by Faculty of Economics upperclassmen, which is why I compared the students with upperclassmen from 2017. Note that the self-directed learning time of students in *Ehime Prefecture : Economy and Issues 2018* is the time spent reading the textbook plus the time spent writing the term paper.

Fig. 1 : Time spent on self-directed learning per week



Source : Created by the author from (a) Matsuyama University, “Basic statistics from student surveys,” (b) *Ehime Prefecture : Economy and Issues 2018* questionnaire results, and (c) *Matsuyama City : Economy and Issues 2018* questionnaire results.

great degree of student overlap between the two courses, which indicates that over the course of the first and second semesters, my students started to voluntarily spend 2 or more hours studying at home (see “2 hours or more, 70%” in “Ehime Prefecture : Economy and Issues 2018” in Fig. 1).

6. Conclusion

This study’s objective is to verify the types of cognitive skills students are able to develop through Problem-Based Learning. I taught the courses the following courses at the Matsuyama University Faculty of Economics : *Ehime Prefecture : Economy and Issues 2018* and *Matsuyama City : Economy and Issues 2018*. In those courses, students were presented economic issues in Ehime Prefecture either by outside lecturers or the course lecturer (me), from which they identified facts from listening to the outside lecturer’s presentation, generated hypotheses, and

analyzed the problems. The learning program was designed so that students would spend time outside of class (1) reading the textbook to acquire the knowledge they were deficient in (regional economic theories); and (2) writing their term paper in order to abstract their newly acquired knowledge. I conclude that Problem-Based Learning and reflection support on the economic issues in Ehime Prefecture (1) fostered students' cognitive skills (problem-solving skills and critical thinking) and non-cognitive skills (independence); and (2) led to continued self-directed learning. This study also showed that through Problem-Based Learning, students' cognitive skills (problem-solving skills and critical thinking) and non-cognitive skills (independence) also became intertwined as they developed.

Postscript

This study was supported by a Matsuyama University 2018 Special Research Grant.

References

1. Ochanomizu University (2016). *Yōjiki no hi-ninchiteki na nōryoku no hattatsu wo toraeru kenkyū : Kansei / hyōgen no shiten kara* [Research to understand the development of non-cognitive skills in early childhood : From the perspective of sensibilities and expressions].
2. Satō, Y. (2014). *Toshi / Chiiki keizaigaku e no shōtaijō* [An Invitation to Urban and Rural Economics], Yūhikaku.
3. Japan Institute of Lifelong Learning (2018). *'Hi-ninchiteki na nōryoku' no gainen ni kansuru kōsatsu* [A discussion of the concept of "non-cognitive skills"].
4. Furukawa, M. (2017). "Gakushūkan no tenkan to chihō daigaku no kanōsei" [Reforming conceptions of learning, and the potential of rural universities], in Kimura, T., and Furukawa, M., eds., *Chihō daigaku no chōsen : Keizai / keiei-kei de no kyōiku jissen* [Challenges for rural universities : Educational practices in economics / business programs], Sekifūsha, pp. 13-36.
5. Matsuyama University Office of the President, Self-Assessment Support Office, and IR Office (2018). "Gakusei chōsa kiso shūkei 2017" [Basic statistics from student surveys 2017].
6. Mutō T. (2016). "Shōga no manabi wo sasaeru 'hi-ninchi-teki na nōryoku' wo dō sodateru ka" [How to cultivate the non-cognitive skills for lifelong learning ?] in *Kore kara no yōji kyōiku 2016* [Future early childhood education 2016], Benesse Educational Research and

- Development Institute, pp. 18-21.
7. Ministry of Education, Culture, Sports, Science and Technology Bureau of Higher Education (2016). “Daigaku ni yoru chihō sōsei ni kansuru torikumi” [Rural development initiatives by universities] (Task Force for the Promotion of Scientific and Technological Innovation for Rural Development, Cabinet Office ; 5th Distribution, Appendix).
 8. Ministry of Education, Culture, Sports, Science and Technology Central Council for Education, Early Childhood education Subdivision (2016). “Shiryō 1 : Yōji kyōiku bukai torimatome (an)” [Appendix 1 : Organization of the Early Childhood Education Subdivision (Proposed)].
 9. Yuasa, K., Ōshima, J., Ōshima, R. (2011). “PBL design no tokuchō to sono kōka no kenshō” [Features of PBL design and verification of its effects], in *Shizuoka daigaku jōhōgaku kenkyū* [Shizuoka University Faculty of Informatics] 16, pp. 15-22.
 10. Hmelo-Silver, C. (2004). “Problem-Based Learning : What and How Do Students Learn ?”, *Educational Psychology Review*, 16(3), pp. 235-266.
 11. Woods, D. R. (1994). *Problem-Based Learning : How to Gain the Most from PBL*, Hamilton ; McMaster University.
 12. Heckman, J. E. (2013). “*Giving Kids a Fair Chance : A Strategy that Works*,” The MIT Press : Boston Review Books.
 13. Johnson, D. W., Johnson, R. T., Holubec, E. J. & Roy, P. (1984). *CIRCLES OF LEARNING : Cooperation in the classroom*, Alexandria : Assn for Supervision and Curriculum.