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Contextual attributes promote or hinder self-regulated learning: A qualitative study contrasting rural physicians with undergraduate learners in Japan

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ABSTRACT

Background and objectives: Previous studies support the notion that East Asian medical students do not possess sufficient self-regulation for postgraduate clinical training. However, some East Asian physicians who are employed in geographically isolated and educationally underserved rural settings can self-regulate their study during the early phase of their postgraduate career. To explore the contextual attributes that contribute to self-regulated learning (SRL), we examined the differences in self-regulation between learning as an undergraduate and in a rural context in East Asia.

Methods: We conducted interviews and diary data collection among rural physicians ($n = 10$) and undergraduates ($n = 11$) in Japan who undertook self-study of unfamiliar diseases. We analyzed three domains of Zimmerman's definition of SRL: learning behaviors, motivation, and metacognition using constructivist grounded theory.

Results: Rural physicians recognized their identity as unique, and as professionals with a central role of handling diseases in the local community by conducting self-study. They simultaneously found themselves being at risk of providing inappropriate aid if their self-study was insufficient. They developed strategic learning strategies to cope with this high-stakes task. Undergraduates had a fear of being left behind and preferred to remain as one of the crowd with students in the same school year. Accordingly, they copied the methods of other students for self-study and used monotonous and homogeneous strategies.

Conclusions: Different learning contexts do not keep East Asian learners from being self-regulated. Awareness of their unique identity leads them to view learning tasks as high-stakes, and to initiate learning strategies in a self-regulated manner. Teacher-centered education systems cause students to identify themselves as one of the crowd, and tasks as low-stakes, and to accordingly employ non-self-regulated strategies.

Introduction

Self-regulated learning (SRL) is defined as learners' active participation in their own learning process from metacognitive, motivational, and behavioral perspectives (Zimmerman 1989). In medical practice, clinical knowledge is continuously advancing, and requires extensive and lifelong SRL (Frank 2005; Sandars and Cleary 2011).

In East Asian education, which is often referred to as Confucian-heritage education, virtue is achieved primarily by learning from teachers and imitating their attitudes (Ho et al. 2001; Tweed and Lehman 2002). From primary to secondary education in East Asia or "China and the countries that were heavily influenced by its culture, most notably Japan and Korea" (Nisbett 2003, p. xxii), reproducing teachers' statements is strongly emphasized. Family members, teachers, and society urge students in pre-university education to attain higher grade point averages and higher rankings to enable them to attend prestigious universities and assure their future success (Ho et al. 2001). Tutors in preparatory cram schools devise strategies to repetitively review past lessons (such as past examination papers) and students try to memorize and reproduce the tutors' teachings to prepare for entrance examinations (Kwok 2004).

Practice points

- Contextual attributes can promote SRL among East Asian learners, who are believed to lack the readiness for SRL in teacher-centered undergraduate education cultures. The quality of SRL should be ascribed to learning contexts rather than local cultural characteristics.
- Immersion in a unique professional role promotes awareness of a novel identity, which motivates individuals to view learning tasks as high-stakes and to initiate learning strategies in a self-regulated manner.
- Teacher-centered education causes students to identify themselves as one of the crowd and tasks as low-stakes. They accordingly employ non-self-regulated strategies.
- To invoke SRL, learning contexts should be more identity-oriented, and learning tasks should be imposed such that learners hold responsibility for their individual roles.

Entrance examinations emphasize accuracy in the reproduction of informational content. Therefore, students matriculating at university are fully accustomed to this teacher-centered learning approach.

University students in East Asia expect their teachers to instruct, and themselves to be instructed or “spoon-fed” (Ho et al. 2001). In the context of medical education, one report showed that medical students in Japan have difficulty extracting problems in problem-based learning (PBL) scenarios without instruction from teachers (Yoshioka et al. 2005). In addition, medical students in Hong Kong prefer explanatory lectures by teachers to lessen the anxiety of PBL discussions while, in the Middle East and the Netherlands, “full” PBL implementations encourage students to engage in more critical discussions (Frambach et al. 2012). PBL sessions require students to extract problems and formulate learning goals in a self-regulated manner. In addition, participants should undertake self-study between PBL discussion sessions to accumulate relevant information to make the discussion sessions more meaningful (Sungur and Tekkaya 2006; Loyens et al. 2008; Sandars and Cleary 2011). Therefore, the lack of participation by East Asian students may suggest that they are not able to adopt learning strategies that require self-regulation. In our previous study, we found that Japanese medical students consistently relied on teachers’ explanatory lectures and had low motivation on self-review after a pilot progress test (Matsuyama et al. 2016). This indicates that Japanese medical students are not ready for self-reflection of their study outcomes.

These results support the notion that East Asian medical students rely strongly on teachers’ instructions for learning activities, and suggest that undergraduates in East Asia may have fewer opportunities for active participation in SRL. Rich (2017) states that the ability to engage in SRL is a key competency that enables residents to learn efficiently through residency programs. Therefore, a lack of readiness for SRL resulting from the current East Asian undergraduate education system is problematic.

Despite this lack of readiness, some East Asian physicians can conduct independent self-disciplined learning without the instruction of teachers in the early stages of their postgraduate careers. For instance, graduates from one medical university in Japan, Jichi Medical University (JMU), are employed in a clinic or hospital in medically underserved or geographically isolated areas during postgraduate years (PGY) 3–9, where consultation with specialists and educational instruction from teachers is minimal (Matsumoto and Kajii 2009). In this system, JMU graduates work as general practitioners in rural settings for the first few years of their postgraduate careers. The rural settings in which JMU graduates are appointed are geographically isolated and medically underserved, and they accordingly have fewer opportunities to develop their clinical knowledge and skills under systematic instructional programs and have little support from specialists. While many physicians in the early stages of their postgraduate careers prefer to be placed in training hospitals in urban settings, 97% of JMU graduates complete their contract-based rural services between PGY 3–9 in such educationally underserved settings (Matsumoto and Kajii 2009). In addition, JMU graduates are reported to have a high-retention rate in medically underserved prefectures after the end of their contract period and to continue to provide professional care in

accordance with rural needs (Matsumoto et al. 2008). This indicates that JMU graduates can improve their professional knowledge in educationally underserved settings, and should be sufficient self-regulated learners to remain in such an environment for an extended period of time. This is stark contrast to the fact that the subjects of our previous study (Matsuyama et al. 2016), which found that undergraduates were not sufficiently ready to conduct self-study without instruction, were all JMU undergraduates.

This gap between a lack of independent study at the undergraduate stage and lifelong and extensive care provision by self-regulated rural physicians suggests that fundamental attributes, aside from cultural influences, can promote or hinder SRL in learning contexts.

To date, contextual attributes in formally structured classrooms and clinical environments have been investigated separately. Those in the former setting include social support, feedback, the opportunity for guided and independent practice, support of reflective practice, and the opportunity to make errors; whereas those in the clinical environment include the curriculum, facilities, atmosphere, patient-related factors, available time, the people present, and engagement of the team (Sitzmann and Ely 2011; Berkhout et al. 2015). Recently, Cho et al. (2017) reported on the changes occurring during the first clinical year among undergraduates according to several categories of the Motivated Strategies for Learning Questionnaire (MSLQ). The MSLQ is composed of 81 items which quantify the scales of nine types of learning strategies (rehearsal, elaboration, organization, critical thinking, metacognitive self-regulation, time and study environment, effort regulation, peer learning, and help seeking), and six variables of motivation states (intrinsic goal orientation, extrinsic goal orientation, task value, control of learning beliefs, self-efficacy for learning and performance, and test anxiety) (Pintrich et al. 1991). However, the types of contextual attributes contributing to these changes have not been specifically investigated.

The aim of this study was to elucidate the contextual attributes promoting or hindering SRL by illuminating differences in learning activities between medical students in teacher-centered undergraduate settings versus rural physicians in geographically isolated and educationally underserved clinical settings in East Asia.

Materials and methods

From an interpretivist paradigm in which “reality” is subjective and context-specific, and multiple truths are constructed by and between people (Bergman et al. 2012), we employed constructivist grounded theory (Creswell 2012) to elucidate the types of contextual attributes that may promote or hamper SRL in two learning settings. We did not use existing structured measures for SRL, like quantitative scales and SRL microanalysis (Sitzmann and Ely 2011), which are comprised of open- and close-ended questions that target the forethought, performance, and self-reflection phases in a cyclical model of self-regulation. We assumed that these tools did not consider or quantify the characteristics of East Asian learners, and may therefore limit our exploration of these unrecognized characteristics of learners in different cultural contexts. We analyzed differences in

self-regulation during learning between two contexts according to Zimmerman's definition of SRL, which comprises metacognitive, motivational, and behavioral perspectives (Zimmerman 1989). The questions used in our semi-structured interviews and diary data collection were in line with these three perspectives. We conducted coding and categorizing in combination with theoretical sampling and repetitive comparison according to constructivist grounded theory. For coding, we referred to the terms used for the sub-processes of Zimmerman's three-phase cyclical model (Artino and Jones 2013). This model depicts three sequential phases of SRL, including forethought (before), performance (during), and self-reflection (after) phases. During the forethought phase, task analysis and motivational beliefs help prepare learners for upcoming learning opportunities. In the performance phase, learners adopt self-control and self-observation in a metacognitive manner to make progress towards a goal. In the reflection phase, learners employ self-judgment and self-reaction to evaluate performance and guide the next forethought phase for subsequent learning opportunities. We also referred to terms used for learning strategies by the MSLQ (Pintrich et al. 1991), which include rehearsal, elaboration, organization, critical thinking, metacognitive self-regulation, time and study environment, effort regulation, peer learning, and help seeking.

We used physicians working in rural settings, mainly JMU graduates, as representative self-regulated learners. We considered that the high-completion rate by JMU graduates of rural medical placement in geographically isolated and educationally underserved settings, and their remarkable medical provision (Matsumoto and Kajii 2009) would be difficult without high levels of SRL. On the other hand,

we used JMU undergraduates taught in the standard curriculum as representative non-self-regulated learners because the education board of this university recognizes and is discussing the excessive reliance on teachers and lack of self-regulation by its students (unpublished data). Moreover, our previous study showed that students at JMU across different school years consistently relied on teachers' explanatory lectures and had low motivation on self-review (Matsuyama et al. 2016). We conducted theoretical sampling based on the assumption that there is a large difference in learning motivation and behaviors between rural physicians and undergraduates. To illuminate the actual difference, we employed a number of rural physicians and undergraduates of different genders and educational experience. Iterative comparison was conducted by analyzing data from one rural physician after one undergraduate, and vice versa, until coding saturation was reached for both groups (Creswell 2012; Hennink et al. 2016). In the end, 21 subjects (10 rural physicians and 11 undergraduates) were enrolled in our study for one-on-one interviews (Table 1). In addition to interviews, we used diaries completed by the same participants to collect a variety of qualitative data (Creswell 2012). Data collection and analysis were conducted from May 2016 to January 2017.

Subjects

We primarily employed physicians in rural settings who were graduates from JMU as representatives of self-regulated learners because JMU specifically places general physicians in geographically isolated and medically underserved areas where graduates from other universities are

Table 1. Characteristics of interviewees and the unfamiliar diseases discussed.

No	PGY ^a	Sex	Unfamiliar disease entity	Data source
R1 ^b	13	M	External ear carcinoma Meningitis caused by acute sinusitis	Interview Diary
R2	18	F	Proton pump inhibitor-induced osteoporosis Chronic hepatitis C	Interview Diary
R3	4	M	Chronic obstructive pulmonary disease IgG4-related disease	Interview Diary
R4	6	M	Corrected transposition of the great arteries Obturator hernia	Interview Diary
R5	16	M	Non-occlusive mesenteric Ischemia	Interview
R6	12	M	Stuttering Atrial fibrillation during dual antiplatelet therapy	Interview Diary
R7	17	M	Tsutsugamushi disease	Interview
R8	12	M	Multiple system atrophy	Interview
R9	12	M	Refractory cancer pain	Interview
R10	16	M	Frontotemporal dementia	Interview
No	SY ^c	Sex	Unfamiliar disease entity	Data source
U1 ^d	Y6	M	Dilated cardiomyopathy Cyclic vomiting syndrome	Interview Diary
U2	Y6	M	Kawasaki's disease Multiple myeloma	Interview Diary
U3	Y3	M	Takayasu's arteritis	Interview
U4	Y2	M	Parkinson's disease Cushing's syndrome	Interview Diary
U5	Y3	M	Basedow's disease	Interview
U6	Y3	M	Rheumatoid arthritis	Interview
U7	Y6	F	Acute appendicitis	Interview
U8	Y4	M	Esophageal cancer	Interview
U9	Y3	F	Amyotrophic lateral sclerosis	Interview
U10	Y4	F	Kawasaki's disease	Interview
U11	Y2	M	Bacterial enterocolitis Food poisoning	Interview Diary

^aPostgraduate year.

^bRural physician 1–10.

^cSchool year.

^dUndergraduate 1–11.

unwilling to work due to the scarcity of training opportunities. All rural physicians invited to participate in this study fulfilled the following inclusion criteria: (1) practiced for more than 2 years in a rural clinic or hospital, where consultation with specialists and regular educational programs were scarce, and (2) currently engaged in primary-to-secondary care in a rural setting. We considered physicians fulfilling these criteria to be sufficiently self-regulated to accomplish learning tasks without the support of specialists. We also employed three doctors (R6, R8, and R9 in Table 1) who were graduates of other medical universities in Japan because they had several years of experience in medical practice in a small rural clinic and are widely known as competent rural physicians through the Japanese media or in the Japan Primary Care Association.

We employed undergraduates from JMU to confirm that their learning environment was sufficiently teacher-centered in accordance with our previous study (Matsuyama et al. 2016). Undergraduate candidates of different genders, school years, and academic performance (according to test scores) were chosen to ensure variation in these characteristics. Students eligible for a unique student-selected component, the Free Course Student Doctor system, were excluded because we did not consider that this cohort received the traditional lecture- and test-dominated East Asian education: these students were allowed to skip all end-of-unit tests (summative assessment tests) and lectures on clinical medicine in the 6th year in exchange for participation in student-selected clinical clerkships.

Instruments

Interviews

After informed consent was obtained, a 60-minute semi-structured interview using four questions (see below) was conducted. The main researcher (YM) interviewed each participant and recorded all conversations during the sessions. All recorded interviews were subsequently transcribed by research assistants.

Because a wide spectrum of learning takes place in medical settings, we specifically examined a learning task in which rural physicians and medical students undertake self-study of a disease that they have newly encountered or recognized through their daily learning activities. We chose this task because learning a disease entity is (1) a fundamental competency for lifelong maintenance of clinical knowledge (Frank 2005), and (2) a common task between medical students and experienced physicians because there are myriads of existing disease entities in medicine, and there are still newly recognized diseases (e.g. IgG4-related diseases) and newly conceptualized diseases (e.g. locomotive syndrome). Questions used in semi-structured interviews, as well as diaries, were formulated to correspond to the three domains comprising the definition of SRL, i.e. "learning behaviors (strategies)", "self-motivation", and "metacognition" (Zimmerman and Pons 1986).

The first question cued interviewees to recall their recent self-learning experience.

Q1. Can you recollect your latest experience of learning about an unfamiliar disease (from definition to clinical features, diagnostic procedure, treatment, and prognosis) and describe how you studied this by yourself?

Subsequently, a dialog was conducted for 45–60 min based on the following three questions (Q2–Q4), which correspond to behaviors (strategies), motivation, and metacognition, respectively:

Q2. In the curriculum or medical practice, how do you usually learn about an unfamiliar disease, and what methods and strategies do you usually apply to self-study?

Q3. Other interests (like watching TV and chatting with friends) can distract from studying. In the curriculum or medical practice, how do you usually motivate yourself, and what methods and strategies do you usually apply for self-motivation?

Q4. In the curriculum or medical practice, how do you usually monitor and assess your understanding about a disease?

Diaries

Diaries help participants to develop deeper insights into their perceptions of learning experiences than those captured by reflection of particular instances of learning, and detailed recording provides more details about individual activities (Porto 2007). After the interview, each participant was asked to write a diary note composed of the same four questions asked in the interview form. They wrote in the diary when they next conducted self-study of a disease within a few months after the interview. They were requested to write only one diary note because we thought that frequent diary writing might be bothersome. The main researcher (YM) sent a reminder e-mail to the participants for diary note submission; however, we had not received diary notes from five rural physicians and seven undergraduates by the time we reached data saturation. We did not follow-up on the reminders to submit diary notes at the time of data saturation because open codes were found to be similar between the interview data and diary data for the same person.

Analysis

In line with constructivist grounded theory (Creswell 2012), transcripts from both interviews and diaries were repeatedly analyzed between interview sessions or diary note collection. Open and axial coding and inductive categorization were conducted in Japanese by YM, and codes and categories were thoroughly reviewed by two Japanese researchers (HO and MN), respectively. The transcripts were analyzed with a focus on statements about learning about unfamiliar diseases. Data collection continued until data saturation, in which no additional codes or categories were identified and the latest interview data were found to be redundant (Hennink et al. 2016) by the three Japanese researchers (YM, HO, and MN). In the selective coding phase, codes and representative speech-supporting codes were translated once into English by professional translators and proofreaders. The other authors (JL and CvDV) subsequently contributed to analysis of the translated data to develop a highly refined version of the generated theory.

Ethical approval and consent to participate

The study was approved by the university's ethics committee (reference number: 15-154).

Results

When asked Q1, both rural physicians and undergraduates first recalled the names of unfamiliar diseases that they most recently studied. They simultaneously recollected their work setting; that is, where and when they conducted self-study of the unfamiliar diseases. They described the appearance of the settings and the things within the settings that motivated them to study those diseases. This process helped them to identify a variety of interactions, both physically and emotionally, that occurred between people in the settings and themselves, while they were undertaking self-study. Rural physicians primarily recalled self-study of unfamiliar diseases in the context of their daily practice. The people they recalled were patients diagnosed with an unfamiliar disease, nurses and other medical professionals in the rural areas, and experts outside the rural community. On the other hand, undergraduates, regardless of school year or interview timing, primarily recalled episodes of self-study in the context of preparing for written tests or interview assessments from tutors and faculty members. The people they recalled included classmates, senior students, and teachers. Both rural physicians and undergraduates eventually identified a locus for acquisition of knowledge where mutual engagement took place between the learner and the surrounding people. Rural physicians tended to view mutual engagement as patient

management in their rural communities, whereas undergraduates viewed mutual engagement as surviving in a cooperative manner in the teacher-centered and test-oriented school environment.

Q2–Q4 inquired about behaviors, motivation, and metacognition, respectively, and helped participants to verbalize the strategies they were employing for these three domains of SRL. When interviewees were asked why they used their described strategies, they primarily explained or justified their behaviors by relating the significance of tasks to the role identified in the locus for acquisition of knowledge.

Therefore, we defined the locus in which interaction between a learner and the surrounding people took place as a *learning community*. We further defined awareness of one’s role in a community as *identity formation*, evaluation of task significance as *task analysis*, and strategies based on identity formation and task analysis as *coping strategies*. It should be noted that there were variations among all the participants. However, iterative comparison between physicians in rural settings and undergraduates in the current East Asian curriculum illuminated explicit differences in these aspects, which provided hints towards understanding the different contextual attributes influencing SRL between these groups.

To summarize, rural physicians recollected experiences of self-study for unfamiliar diseases in the learning context

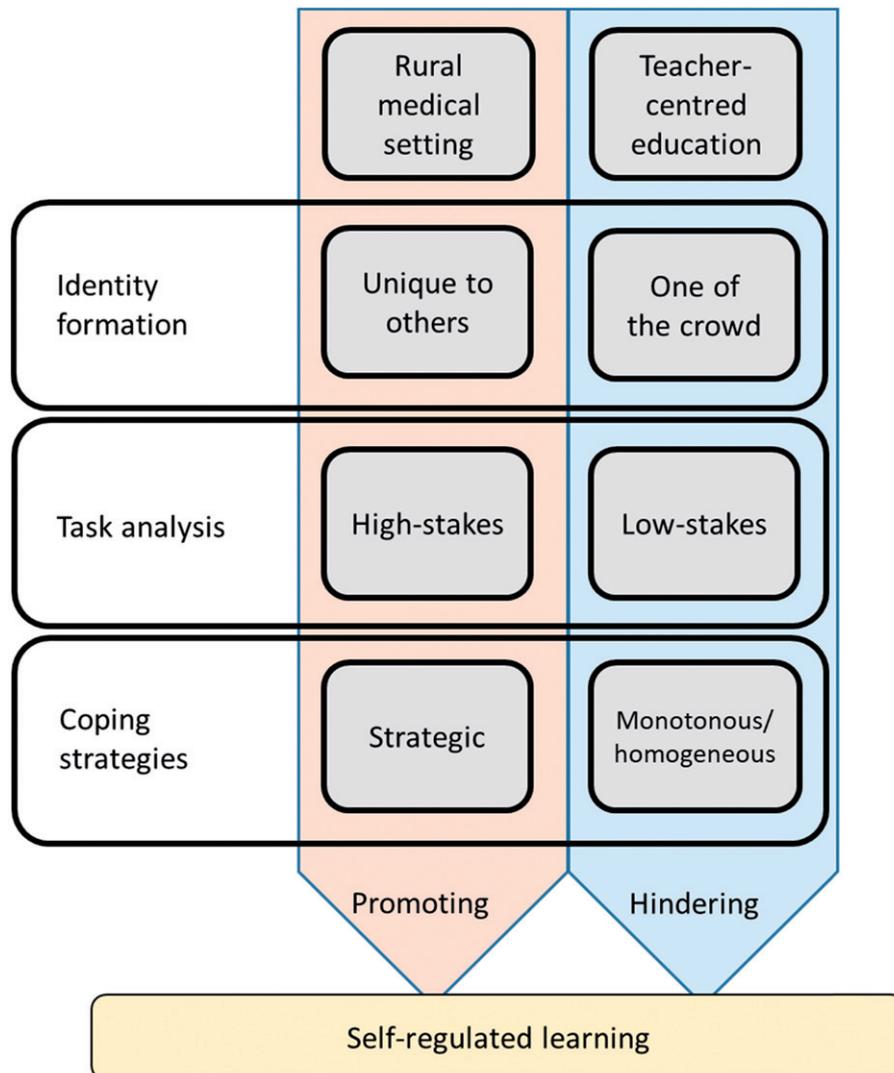


Figure 1. Contrast of contextual attributes between a rural medical setting and teacher-centered education.

where he/she saw his/her identity as unique in the rural community, and considered the learning task as high-stakes. Accordingly, they actively sought learning strategies. Undergraduates recalled self-study of unfamiliar diseases in the learning context of preparing for an exam such as to remain in pace with others under the pressure of tests, and considered his/herself as one of the crowd. Learning tasks were seen as low-stakes to avoid failing tests, and strategies were monotonous and homogeneous (Figure 1).

Identity formation

Rural medical setting

Rural physicians perceived themselves to be in a unique position with respect to other members of the community because of their professional knowledge and skills in a geographically isolated and medically underserved environment with few specialists.

Well, it was more like there was no other choice. There weren't really any other medical institutions around except for mine, you see. Even if I was to refer them to a specialist, I was located a good 60 or 70 km from somewhere like a neurology clinic at the time. (R10: PGY 16)

I came to realise that no one would teach me anything if I didn't make an effort on my own when I travelled elsewhere in my third year. It was less like they wouldn't tell me anything and more like they didn't have the knowledge, period. So I pretty much had to do it myself. (R5: PGY 16)

Because of the dearth of alternatives in geographically isolated situations with few specialist resources, the physicians found that they could not rely on the attitude of "*I won't see you, find some other institution*" to avoid contextual challenges. Although they were not able to address all medical problems, they tried to find what they could do for patients.

I never say "I won't see you, that's it. Find some other institution". Even if I can't treat them myself, I always make sure to work with the patient to guide them on their next move like, "You may be able to get treated if you do this..." and at the same time, I take care to avoid patients on the phone feeling like they were just bluntly refused out of hand. (R6: PGY 12)

Identity formation as a unique medical professional in the community led to the perception that the physicians had to allow patients to ask them about any wide-ranging medical problem. Rural physicians perceived that they were expected to have broad knowledge as preparation for consultation about any and all medical problems. They described the unique identity of a medical professional in a rural setting as a specialist who allowed patients to consult them about any problem.

[I feel that] letting patients consult with us about any problem is our specialty. (R5: PGY 16)

The rural physicians were not stand-alone or self-righteous. They humbly viewed their unique professional abilities as essential and did not think that their sole contribution would improve the practice in the community. Rural physicians recognized that their individual self-study could help to improve the quality of medical practice at the whole community level. They were not confident being the center of the community but perceived themselves as

having been invited to the central role, and this perception strengthened their unique identity.

At first, I just thought of my skills as my own. But recently, I have perceived them as skills for the community... if my skills improve, homecare managers may say that we might do it that way too. If it goes viral, it would result in levelling up of care for entire rural community. But I myself don't have what authentic professionals have, so I am not sure. But I hope the community raises its care levels as a whole. (R9: PGY 12)

Teacher-centered education

Most undergraduates recalled their test preparation when asked about their latest experience of self-study of unfamiliar diseases. They described that the fear of failing exams outweighed the desire to learn about diseases with clinical significance. They felt that teachers' judgment of their test performance could ruin their individual learning processes.

Teachers cannot see... the intense effort I make. After all, even though I may understand 90% of the facts of the disease, not knowing the remaining 10% could result in failure to answer that one question, and if I only know 90% of the next disease entity, one wrong answer may follow another. A bad test score can result in my being labelled as not studying at all. (U1: Year 6)

Undergraduates also articulated a fear of lagging behind their classmates. They wanted all classmates to pass the exam and graduate in a cooperative manner.

The urge to graduate along with my current circle of friends is probably the strongest right now, yeah. Studying and learning alongside them in the same class year and being able to graduate with them is what I most want to do. (U2: Year 6)

From this perspective, they felt comfortable being among other students but felt uncomfortable when there were differences in academic level among the students. As a result, a learning community directed to succeeding in assessments formed among the students. They were likely to view themselves as one of the crowd within the community.

Task analysis

Rural medical settings

Daily practice and being exposed to a variety of patients' health problems kept them aware of the range of diseases that they needed knowledge for their unique professional role. The statement "I absolutely have to be prepared to deal with" in the following quote indicates that rural physicians recognized themselves as the only professional in the community who could deal with the variety of diseases.

What keeps me diligent and never lets my ambition slip is having all kinds of patients visit me every day and knowing that there are a lot of issues I absolutely have to be prepared to deal with. (R3: PGY 4)

However, their feeling of confidence when addressing the task was not always high. One experienced rural physician described the rural community as a place where he was "taken hostage". He noted that rural physicians perceived that they were at risk of making incorrect decisions if they conducted self-study inappropriately, and that all of their mistakes could be scrutinized by the community at

any moment. The fear of making mistakes outweighed self-efficacy in their profession in an isolated rural environment.

I used to treat patients feeling like I'd been taken hostage. Rather than seeing it as my duty, I was focused on what I saw outside my window; rather than seeing this as a step in my life as a physician, I was worried about what people would say about me if I screwed up out here. [...] There was almost nothing that made me happy going to a rural area and meeting sick patients. In fact, what gave me the energy to make it through the day was really the thought of the damage I'd cause if I failed. Like, "I'd better not mess up". (R7: PGY17)

Such a conflict between the fear of making mistakes and the image of their unique professional role in handling a variety of diseases made them perceive their learning tasks as high-stakes.

Teacher-centered education

Undergraduates had a fear of lagging behind their classmates and preferred to be one of the crowd in their learning communities, where they were driven to learn about unfamiliar diseases so as not to fail exams. They monitored their understanding about unfamiliar diseases through conversations with other students in the same school year. If they recognized that other members had a better understanding of diseases than themselves, they attempted to decrease the difference. However, if they felt themselves able to keep up, they tended to be satisfied regardless of their depth of understanding of the disease.

I feel like I'm able to more or less keep up with the others in my group when talking on the way to our department. I realise I'm simply comparing myself to others, but feeling like I'm not lagging behind is one of the basic criteria. (U5: Year 3)

Undergraduates did not base their learning goals on their own absolute understanding or clinical significance when they learned about unfamiliar diseases. They were likely to reconcile outcomes of self-study to those of other members. For them, the aim of learning about unfamiliar diseases was not associated with acquiring applicable knowledge for their future medical practice.

Well, I'm not terribly bright, so my test scores have never been phenomenal. But I think there's a bit of a difference between being able to ace a test and what you're capable of doing once you're a doctor. Studying for a test differs from studying for my future for what will be applicable later. (U3: Year 3)

Therefore, they were not fully encouraged to deepen their understanding about unfamiliar diseases. Overall, students' perceptions about the irrelevance of test outcomes for clinical competency, and minimum goal setting based on the understanding of other community members could cause undergraduates to perceive learning tasks as low-stakes.

Coping strategies

Rural medical settings

To cope with what they viewed as high-stakes tasks, rural physicians began to employ some learning strategies noted in Zimmerman's model and Pintrich's MSLQ, such as attention focusing, self-reflection, and critical thinking. For example, they strengthened "attention focusing" by articulating the aim of the self-learning to clarify their learning goals. As they needed to provide concrete solutions for

numerous clinical problems, they chose to focus on specific domains like diagnosis, treatment, and prognosis of current clinical problems, rather than developing a superficial understanding of the whole domain of the new disease.

For a given patient, I was first concerned with how to proceed with the initial examination—like how should I make my diagnosis, how should I set things up. I would then look into the treatment once we reached the treatment stage later on. (R1: PGY 14)

Physicians became highly attentive to small errors in their understanding because they perceived that inappropriate knowledge could cause negative outcomes. For example, when providing information on diseases to patients, rural physicians were likely to evaluate the accuracy of their own understanding in a very attentive manner.

I worried that something I said might kill the patient. That fear dogs me even now. (R7: PGY17)

Focused attention to detailed knowledge about unfamiliar diseases encouraged rural physicians to base their understanding on reliable information. They rigorously sought information about unfamiliar diseases from as many resources as possible, and compared the quality of information among resources. They attempted to access information authorized by specialist committees (including guidelines), comments from experienced experts, and online information sources updated on a regular basis (e.g. Uptodate[®]), and simultaneously critically evaluated the quality of the information ("critical thinking" in MSLQ).

Eager to obtain basic information about an obturator hernia as quickly as possible, I planned to read UptoDate's summary and recommendation sections. However, when I searched UptoDate, I only found the term "obturator hernia" with no subsections of focus, and I eventually gave up when all I could find was a large summary on intestinal obstruction. The situation was the same when I consulted Harrison, which lacked even the basic information I wanted to know. [...] I checked a textbook I found on the desk of my colleague, but it was no help. [...] For the time being, I searched for articles using Google, PubMed, and Medical Online. (R4: PGY 6)

They began to evaluate the accuracy of acquired knowledge in a metacognitive manner by asking for diverse opinions outside the rural community. Some rural physicians intentionally presented their knowledge via social networking sites after learning about unfamiliar diseases to receive feedback for self-reflection.

I have my own internet site and regularly post what I study... I conduct self-evaluations and receive feedback. In the process, I perform self-reflection, which may be a way of learning about myself. (R7: PGY17)

Teacher-centered education

Their learning goals were associated with passing an exam. The range of information that they acquired about new diseases was likely to correspond to the range of subjects studied for test preparation.

I sometimes skip parts of learning materials that were not tested in the past. (U3: Year 3)

Undergraduates limited their learning to the extent of other students' knowledge of unfamiliar diseases rather than the disease's clinical significance. When they found

learning materials difficult to understand, they sought answers from agreement among peers (mainly like-minded friends and sometimes senior students); however, they avoided critical thinking and did not attempt to find more reliable and authentic information by referring to a variety of information sources or consulting experts.

When the word is still unclear after looking it up again and again, well, I will ask my friend who is good at studies for a general outline of the word, and pretend to get it. (U7: Year 6)

They did not attempt to study more detailed learning contents than their classmates. They preferred to use materials like resumes (summary of lectures) prepared by teachers and textbooks recommended from other students because the provided information was considered to be highly likely to be tested.

What is written in resumes may be what is asked in tests. And textbooks are so thick that I would wonder what is important... of course all of it important, but I can learn what is really important by referring to the domains written in resumes. (U11: Year 2).

They were eventually likely to undertake self-study in a monotonous and homogeneous manner.

Discussion

This study revealed the differences in Zimmerman's three domains of SRL (motivation, behaviors, and metacognition) when engaging in the same learning task (self-study about unfamiliar diseases) in two distinct learning contexts (rural physicians and undergraduate medical students). Rural physicians undertook self-study of unfamiliar diseases in a highly motivated, strategic, and metacognitive manner according to their unique identity in a rural community. Undergraduates in East Asia conducted self-study in a monotonous and homogeneous manner that was dependent on the behaviors of their classmates and not on themselves in a community engaged in test preparation. Although, the rural physicians and undergraduates in this study received the same conventional undergraduate education, referred to as Confucian-heritage education, the two groups of learners employed different levels of self-regulation in motivation, behaviors and metacognitions. This indicates that contextual attributes can influence SRL differently even when learning tasks and previous learning experiences are the same.

Rural physicians mainly recalled how they perceived and what strategies they used in self-study of an unfamiliar disease in their daily practice. In contrast, most undergraduates, regardless of school year and timing of interview, recalled episodes of self-study in the context of preparing for exams. Although there are many other learning situations for undergraduates and rural physicians, we think that our methods effectively illuminated two distinct learning contexts, both of which were relevant to and are representative of daily learning activities for both the groups.

The questions used in the interviews and diaries focused on self-study activities in a particular self-study setting. This could create a contrast between self-activity and the surrounding environment, and might help participants articulate the activities of individual learners and existing factors, including other members in the

environment. Wenger (1998) claims that learning for individuals is not only an internal process but rather an issue of engaging in and contributing to the practices of communities. In his definition, communities are not just spatial structures like a residential neighborhood. He coined the phrase "communities of practice", which he defines as "groups of people who share a concern, set of problems, or passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (Wenger et al. 2002, p. 4). He associated learning with the community of practice in his book (1998). He claims that practices evolve as histories of learning are shared through participation and reification in communities, and emphasizes that access to competence and personal experience of mutual engagement in learning enhances identity formation in learning communities. In other words, learning communities are a "place of identity to the extent they make trajectories possible (Wenger 1998, p. 215)."

In this study, we observed two communities of practice. The first involved experienced nurses, other medical professionals, homecare managers, physicians with unique professional knowledge and skills, and locals who continuously scrutinize new rural physicians. Although in reality rural physicians learned unfamiliar diseases alone, qualitative data indicated that their perceptions and actual behaviors were based on the learning community as a community of practice, and was aimed at patient management in the rural area. Rural physicians felt that the community gave them full responsibility for the outcomes of their learning tasks, because there was no substitute expert medical practitioner in the community. In line with the theory of community of practice (Wenger 1998), rural physicians are highly inclined to experience insider trajectories that prompt them to evolve the community through high accountability. A quote from a rural physician saying his self-study can "result in leveling up of care for entire rural community" might support this idea. In other words, rural physicians perceive that their learning activities, being based on their unique identities in the community, contribute to the improvement of patient management in their rural community.

In contrast, undergraduates formed a community of practice in which mutual engagement was "not to fail assessment tests nor be left behind others." Undergraduates did not actively evolve the community by participating in the central role or intentionally place themselves outside the community for fear of isolation. The theory of community of practice indicates that identity formation takes place by identification and negotiability through participation or nonparticipation in certain communities (Wenger 1998). Therefore, by positioning themselves between the center and the periphery of the community, and by simply doing as others do without active negotiation, the identities of undergraduates became less explicit or more "one of the crowd".

Their preference for being "one of the crowd" and their monotonous and homogeneous learning behaviors might be interpreted as collectivism, which is often characterized as being unique to East Asian cultures. Hofstede (2001) identified important elements that account for differences in behaviors between cultures: individualism and collectivism. In collectivistic cultures, members are concerned with

the well-being of the in-group, and tend to prioritize the goals of the in-group. They control their behaviors such as remain in line with the in-group's norms rather than for personal purposes. Members of individualistic cultures are likely to focus on personal goals over those of the society. East Asia is often used as a representative of a collectivistic culture, while Western cultures, such as the United States, are used as an example of an individualistic culture (Hofstede 2001). However, we want to emphasize that, even if collectivistic learning values prevail in East Asia, contextual attributes in a different learning setting do not keep East Asian learners collectivistic and passive; rather, contextual attributes encourage them to become independently self-regulated.

It is possible that rural physicians, who are placed in an isolated environment, would accordingly simply be obliged to study alone, and these actions may therefore not be associated with SRL. However, SRL is different to simple self-learning. SRL involves seeking help from experts and various resources to deepen understanding, even when learners are situated in isolated environments (Ryan and Pintrich 1997; Newman 2012). In this study, rural physicians were eager to seek authorized information using online resources (UptoDate[®]) and feedback from experts and colleagues not only within the community but also outside the community via social networking sites. They did not allow their isolated situation to compromise them or behave in a dogmatic manner.

It could also be viewed that rural physicians were obliged to conduct self-study merely for fear of "making mistakes" and "being scrutinized by the community", indicating that their motivation is external, which is contradictory to intrinsic motivation emphasized by SRL (Reeve et al. 2012). However, rural physicians attempted to expand the contents of their learning as much as possible, and extended the domain of knowledge in response to practical needs. Rural physicians did not compromise their learning by pursuing it only so far as to avoid criticism from the rural community, in contrast to undergraduates, who pursued learning merely so far as to avoid failing tests. Their state of motivation could be explained by the self-determination theory proposed by Deci and Ryan (Ryan and Deci 2000; ten Cate et al. 2011). According to this theory, there are four stages of regulation within extrinsic motivation between amotivation and intrinsic motivation. Learners can proceed through the four stages of external, introjected, identified, and integrated regulation as their self-regulation shifts from controlled to autonomous. The integration of regulation, in which learners can connect extrinsic rules to their own norms and values, is the closest stage to intrinsic regulation (or motivation). Rural physicians in this study were able to internalize the pressures arising from their fear of "making mistakes" and "being scrutinized by the community" and accept these perceptions by combining them with their unique but socially important identity.

Overall, this qualitative study shows that immersion in a responsible individual role, which promotes identity formation in the learning community, causes learners to view learning tasks as high-stakes, and to initiate learning strategies in a self-regulated manner. Contextual attributes can promote SRL even among East Asian populations, who are believed to lack SRL during undergraduate education. On

this basis, insufficient SRL should not be attributed to the cultural values of learners, but rather to contextual attributes existing in the current teacher-centered undergraduate curriculum. The contextual attributes hindering SRL might include feeling the need to be "one of the crowd" or decreasing individual identity formation, which might cause learners to view learning tasks as low-stakes and employ learning strategies in a monotonous and homogeneous manner.

Application of our results to the current undergraduate education system for further development of SRL may help to form a more identity-oriented learning context. Learning contexts can be individualized in accordance with learners' abilities and tasks can be imposed with sufficient responsibility.

Strengths and limitations

The strength of this study is that we illuminated the contextual attributes that promote or hinder SRL by contrasting learning activities between learners in two different contexts within the same culture. By contrasting the two contexts in the same culture, we were able to show that fundamental contextual attributes which influence SRL are independent of cultural characteristics. As a result, these findings are expected to be generalizable to other cultural contexts.

One limitation of this study is that we compared self-study activities between two groups in different developmental phases. Rural physicians, who have had longer careers than undergraduates, could have utilized their prior knowledge and experience to behave in a more self-regulated manner. Therefore, the self-regulated characteristics of rural physicians could be attributed to their maturity as professional doctors rather than to any rural context. We could have compared the self-study activities of physicians of the same PGY in rural settings and non-rural settings. However, we used undergraduates to confirm that their learning environment was sufficiently teacher-centered, in accordance with our previous study (Matsuyama et al. 2016).

Another limitation of this study is that we mainly investigated undergraduates at a single medical university in Japan. JMU is well known for its high pass rate in the national licensing exam, so undergraduates might be more motivated to follow suit in their learning activities. This study, however, showed that rural physicians who received the same conventional undergraduate education (JMU undergraduate curriculum) could become self-regulated after being employed in rural settings. From this point of view, limiting the subjects to one university may have helped to illuminate the difference between "before" and "after" exposure to a learning context, which requires full participation as a unique role in a learning community.

Finally, this study only investigated learning activities of self-study with regard to knowledge of unfamiliar diseases. Learners' competencies for self-regulation in learning are applied not only to self-study aimed at clinical knowledge but also learning in groups or of clinical skills. Recent theories suggest that self-regulation in learning can be developed through social transactions, which is considered the

central core of regulated learning (Rich 2017). In the context of this study, rural physicians might develop competency for self-regulation through interactions with experienced nurses in a flattened hierarchy during staff meetings, whereas undergraduates might avoid seeking help because of scarce interactions with teachers who are higher up in the hierarchy. This study only explored individual learners' perceptions and past experiences according to the conventional social cognitive model of SRL. Future studies should focus on dynamic social interactions influencing SRL.

Conclusions

A learning context with immersion in a socially responsible role promotes physicians' identity formation as a unique professional. This may cause them to view learning tasks as high-stakes, and lead to the initiation of SRL strategies. In contrast, teacher-centered learning environments may cause students to identify themselves as one of the crowd, and to view tasks as low-stakes. Accordingly, they employed monotonous and homogeneous strategies.

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Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

Glossary

Self-regulated learning (SRL): Learners' active participation in their own learning process from metacognitive, motivational, and behavioral perspectives

Zimmerman BJ. 1989. A social cognitive view of self-regulated academic learning. *J Educ Psychol.* 81:329–339.

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