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**The effect of self-regulated learning on college students' perceptions of community of inquiry and affective outcomes in online learning**

**Abstract**

The purpose of this study was to examine the effects of students' self-regulated learning (SRL) levels on their perceptions of community of inquiry (CoI) and their affective outcomes (task-specific attitudes and self-efficacy). Participants were 180 college students enrolled in a required online course. Using the cluster analysis method, SRL levels were grouped into four levels (High regulators, Mid regulators lacking efforts, Mid regulators lacking values, and Low regulators). ANOVA revealed that highly self-regulated students demonstrated a stronger sense of CoI and achieved higher affective outcomes, compared to low self-regulated students. The finding confirms that SRL could play an important role in the framework of community of inquiry.

Key words: Self-regulation, Self-regulated learning, Community of Inquiry, Learning Presence, Online Learning

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## **The effect of self-regulated learning on college students' perceptions of community of inquiry and affective outcomes in online learning**

Community of inquiry (CoI) has been one of the frequently used frameworks in online learning research and pedagogy to enrich students' learning experiences (Annand, 2011; Arbaugh et al., 2008; Garrison, Cleveland-Innes, & Fung, 2010; Rockinson-Szapkiw, Wendt, Wighting, & Nisbet, 2016). CoI emphasizes the importance of *co-efforts* among the online community members (e.g., the instructor and students) to bring about meaningful learning experiences (Annand, 2011). In the CoI perspective, the instructor's role is important, in that she/he designs the online course to support student's cognitive development, as well as facilitating interactions among the students and between the instructor and students (Akyol & Garrison, 2011). Additionally, each student's commitment to cultivating a positive learning community could be another important factor for success with the CoI framework. In online learning, students play a more demanding role (Bol & Garner, 2011; Broadbent & Poon, 2015) and take more responsibility for their learning (Barnard, Paton, & Lan, 2008; Cho, Demei, & Laffey, 2010), compared to face-to-face settings. Nonetheless, such student driven factors have often been neglected in the research on community of inquiry (Shea & Bidjerano, 2010; 2012).

In particular, self-regulated learning (SRL) is considered an important factor for explaining learning experiences of the students who are successful in online learning (Bol & Garner, 2011; Broadbent & Poon, 2015; Cho & Heron, 2015). SRL significantly influences their achievements and satisfaction in online courses (Broadbent & Poon, 2015; Kuo, Walker, Belland, & Schroder, 2013). In this study, therefore, the authors have examined whether different levels of self-regulated learning would influence college students' perceptions of community of inquiry and their affective outcomes (task-specific attitudes and task-specific self-efficacy beliefs).

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## Theoretical Background

### Community of Inquiry

Theoretically, Community of inquiry (CoI) is situated in social constructivism that views collaboration among the participants as a catalyst for meaningful knowledge creation (Garrison, Cleveland-Innes, & Fung, 2010). Students' mindful engagement in interactions with the instructor and with other students can help them to develop relevant knowledge (Garrison, Anderson, & Archer, 2001).

Three types of presence constitute the CoI framework: social presence, cognitive presence, and teaching presence. Social presence refers to "the ability of participants to identify with the community (e.g., course of study), communicate purposefully in a trusting environment, and develop interpersonal relationships by way of projecting their individual personalities" (Garrison, 2009, p. 352). Social presence emphasizes participants' communication skills in relation to other members and contributes to the creation of a collaborative learning climate (Akyol & Garrison, 2011). Cognitive presence refers to "the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry" (Garrison, Anderson, & Archer, 2001, p. 11). Through cognitive presence, students develop meaningful knowledge. Teaching presence refers to "the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes" (Anderson, Rourke, Garrison, & Archer, 2001, p. 5). Teaching presence plays a key role for cultivating and sustaining social and cognitive presences (Akyol & Garrison, 2011; Garrison, Cleveland-Innes, and Fung, 2010). In general, it is believed that CoI could maximize students' learning experiences since the three presences integrally promote social and intellectual interactions among the participants and

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materials and, thereby, fruitful learning outcomes (Annand, 2011).

### **Self-Regulated Learning**

Self-regulated learning (SRL) is defined as learners' systematic effort to manage their learning process to attain personal goals (Zimmerman & Schunk, 2011). When facing a new task, self-regulated learners proactively set learning goals and engage in the process of achieving the goals, such as planning tasks, monitoring progress, and reflecting goal accomplishment. The self-regulated learning (SRL) process can be explained in terms of students' motivation and their use of cognitive strategies (Abar & Loken, 2010, Pintrich, 2004; Zimmerman, 2008).

Motivationally, self-regulated learners have four key qualities: intrinsic goal orientation, high confidence in learning, high control beliefs in learning, and high task value. These four qualities must be understood if one is to grasp the significance of self regulation in learning. First, intrinsic goal orientation refers to students' disposition toward mastering the content or task. Students who have intrinsic goal orientation engage in setting personally meaningful goals instead of external goals (e.g., getting a good grade to show off to others). They voluntarily monitor, reflect, and adjust the learning process and also attribute their failure to mismanagement of the process or misuse of learning strategies.

Also, confidence in learning leads to learners' deeper engagement in SRL process. Confident students not only use deep learning strategies such as rehearsal, elaboration, and organization (Pintrich, 1999) but also participate in online social interaction more strategically (Cho & Jonassen, 2009). Closely tied to confidence in learning is a student's control belief in learning. When students believe that they have control over their learning, they are more likely to initiate personal goal setting and monitor and adjust their learning process. When these adjustments lead to success, students' confidence is bolstered and they are motivated to continue

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to make efforts to achieve their goals.

The quality of task value also influences self-regulation. Task value means perceived value of doing a task. According to Lawanto and colleagues (Lawanto, Santoso, Goodridge, & Lawanto, 2014), college engineering students with high task value set their goals and evaluate their learning process systematically, as well as being more strategic to accomplish the goals. In addition to the four qualities, effort regulation is critically involved in the SRL process. Effort regulation refers to students' capacity to persist and put an effort in academically challenging situations (Broadbent & Poon, 2015). Even when they are not intrinsically motivated while facing an academically challenging task, highly self-regulated learners strategically manage their effort and complete tasks (Broadbent & Poon, 2015; Cho & Shen, 2013).

Perhaps not surprisingly, the self-regulated learning process and students' affect are reciprocally related (Zimmerman & Schunk, 2011; Pintrich, 2004). Positive affect is essential for proactive and consistent engagement in SRL processes (Cho & Heron, 2015; Pintrich, 2004; Zimmerman & Schunk, 2011). In a recent study, Cho and Heron (2015) compared passing and non-passing students' motivation and emotion in an online remedial mathematics course. Passing students' motivation such as task value and self-efficacy were positively related to students' course satisfaction, whereas non-passing students' motivation and emotions (such as test anxiety, frustration, and boredom) were negatively related.

### **Different Levels of SRL**

Fundamentally, every learner self-regulates their learning to a certain degree; however, the levels of self-regulation vary (Zimmerman, 1990). Zimmerman's view is that self-regulation is a continuum between less skillful and skillful self-regulated learners (Zimmerman, 1989).

Researchers in SRL describe that skillful self-regulated learners have the capacity to set proximal

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goals, showed mastery learning goals and high confidence in their learning, and attributed their unsatisfactory outcomes to the misuse of learning strategies or their failure to effectively manage the learning resources (Pintrich, 2004; Zimmerman, 2008). In contrast, less skillful self-regulated learners often fail to set proximal goals, tend to pursue performance avoidance goals, demonstrate low confidence in learning, and attribute their unsatisfactory performance mainly to external sources, such as the instructor or ineffective course design.

### **SRL in Community of Inquiry**

Recently, some researchers in online learning suggest that SRL be added as learning presence to the CoI framework, along with social, cognitive, and teaching presences. In a study by Shea and Bidjerano (2010), teaching and social presences are positively correlated with confidence in learning, but cognitive presence is positively correlated with effort regulation. Defining learning presence in terms of learners' confidence and effort regulation, these researchers call for future studies that will incorporate learner characteristics into the CoI framework and expand their conception of learning presence.

In contrast, Akyol and Garrison (2011) argue that SRL can be understood as the interaction of cognitive presence and teaching presence, rather than viewing SRL as a separate variable in the CoI framework. Garrison and Akyol (2015) have brought forth the concept of shared regulation in the CoI framework. They define shared regulation as both self-regulation and co-regulation of cognition in online collaboration. When students collaborate, they not only self-regulate but also co-regulate each other's efforts. Individually, students monitor and control their cognition; collaboratively, they co-monitor and co-control their group's cognition.

Motivated by this on-going debate about the role of self-regulation in the CoI framework, the current study explored the effects of SRL levels on college students' perceptions of

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community of inquiry (i.e., social, cognitive, and teaching presences) and their affective learning outcomes. The affective outcomes included students' attitudes toward technology integration into classrooms and their sense of self-efficacy in integrating technology integration.

## **Hypotheses**

The study was conducted with three hypotheses:

H1. Students with high SRL will demonstrate higher perceptions of community of inquiry than students with low SRL.

H2. Students with high SRL will demonstrate more positive task-specific attitudes than students with low SRL.

H3. Students with high SRL will demonstrate higher task-specific self-efficacy than students with low SRL.

## **Method**

### **Participants**

Participants were 180 undergraduate students enrolled in an online course, offered by the college of education at a mountain-west public university in the United States. The course was required for pre-service teachers working on obtaining teaching certificates. Among 180 participants, 151 students were female, and 29 students were male, with an average age of 24.40 ( $SD = 6.34$ ). The majority of the participants were either juniors ( $N = 88, 48.9\%$ ) or seniors ( $N = 78, 43.3\%$ ), with a few exceptions (13 sophomores and 1 freshman). The study was conducted in one year, fall 2015 – spring 2016.

### **The Online Course**

The credit-bearing course, *Technology Tools and Integration for Teachers*, was delivered online using Instructure Canvas (<https://canvas.instructure.com>). The learning goal of the course

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was for pre-service teachers to develop positive attitudes toward technology integration and increase their sense of self-efficacy in integrating technology into their teaching. In the course, students were introduced a variety of ways to integrate available technological tools into classroom instruction while getting familiar with the educational tools. Since many of the students were proficient users of everyday technologies (e.g., mobile phones, tablets, and social media), the course emphasized developing the future teachers' positive affect about the educational use of those technologies, rather than learning the tools for the tools' sake. The course had fourteen weekly learning modules and the relevant weekly assignments, with each module dealing with one free digital tool. Students learned the modules (one module per week) and completed the assignments by themselves online. The course had a grading teaching assistant, who graded students' weekly assignments according to the preset rubrics. The sum of the weekly grades made up the final grade.

### **Course Design in the CoI Framework**

Overall, the course was designed in the framework of community of inquiry, including social presence, cognitive presence, and teaching presence. For example, to encourage social presence, the first assignment asked students to find a partner, read an article with the partner, and write a collaborative review of the article using Google Document. In addition to interacting via the Google Doc, students voluntarily posted their questions and ideas on discussion boards throughout the semester. Students also were encouraged to share their assignment products and provide feedback on the boards.

In addition to encouraging social presence, the course also encouraged cognitive presence, and lesson materials were explained not only in text but also with video tutorials. Assignments were presented in order of task performance step by step. Submission checklists

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were added at the end of the assignment pages, ensuring that students could complete the tasks without missing any important components. A weekly announcement that was posted every Monday morning served as a reminder of weekly tasks.

Regarding teaching presence, every lesson module started with the instructor's video clip to briefly overview the weekly task. Following the literature in teacher-student relationships (Micari & Pazos, 2012), the instructor used strategies to build rapport with the students in each video; the instructor did this by sharing personal and professional interests, showing genuine interest in helping the students to engage, and giving periodic reminders of to listen closely or review material. Also, timely responses to students' inquiry were another focal strategy to enhance teaching presence. The instructor checked for students' posts at a regular interval (three times a day) and provided feedback immediately, so that the students could feel they were heard and cared for by the instructor.

## **Instruments**

Four instruments were used for the study, measuring students' SRL levels, their perceptions of CoI, their attitudes toward technology integration, and their self-efficacy beliefs in technology integration. All measures (see Appendix A) were scaled in a 7-point Likert scale, ranging from 1 "strongly disagree" and 7 "strongly agree."

SRL was measured using the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1993) whose items were modified slightly to fit to the online learning context. The questionnaire included five constructs: intrinsic goal orientation (four items), confidence in learning (four items), task value (four items), control beliefs in learning (four items), and effort regulation (four items). An example item of intrinsic goal orientation was: "In a class like this, I prefer course material that really challenges me so I can

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learn new things.” An example item of confidence in learning was: “I believe I will receive an excellent grade in this online course.” An example item of task value was: “I think I will be able to use what I learn in this course for classroom teaching.” An example item of control beliefs in learning was: “If I study in appropriate ways, I will be able to learn the topics covered in this course.” An example item of effort regulation was: “Even when course materials are dull and uninteresting, I manage to keep working until I finish.” In this study, item reliabilities were evaluated using Cronbach Alphas:  $\alpha = .75$  for intrinsic goal orientation, .92 confidence in learning, .89 task value, .81 control beliefs in learning, and .71 effort regulation.

Community of inquiry was measured with the modified CoI instrument, consisting of social presence, cognitive presence, and teaching presence (Arbaugh et al., 2008). We used the items closely relevant to the current study, so we could accurately measure the participants' perceived community of inquiry. Social presence was measured with seven items. An example item was “I felt comfortable conversing through the online medium.” Cognitive presence was measured with six items. An example item was “The topics stimulated my interest in the course.” Teaching presence was measured with 10 items. An example item was “The instructor provided clear instructions on how to participate in course learning activities.” In this study, item reliabilities were evaluated as  $\alpha = .82$  for social presence, .90 cognitive presence, and .94 teaching presence.

Attitudes toward technology integration into classrooms were measured with modified nine items derived from Sang, Valcke, Van Braak, and Tondeur (2010). An example item was “Using computers provides new opportunities for improving learning.” Item reliability was evaluated as  $\alpha = .94$ .

Self-efficacy beliefs in technology integration into classrooms were measured with nine

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items derived from Wang, Ertmer, and Newby (2004). An example item was "I feel confident that I understand computer capabilities well enough to maximize them in my classroom." Item reliability was evaluated as  $\alpha = .95$ .

## **Procedures**

The research was approved by the campus Institutional Review Board (IRB) and conducted accordingly. A total of enrolled students in the two sections of the course was 186. Among them, 180 students voluntarily participated in the study, showing 96.77% participation rates. On the third week of the course, students took an online SRL survey. On the thirteenth week of the course, students took a CoI survey, an attitudes survey, and a self-efficacy survey.

## **Data Analysis**

A cluster analysis was conducted to identify students' SRL levels. Cluster analysis is an exploratory multivariate statistical technique that group students into relatively homogenous groups, based on SRL constructs that include intrinsic goal orientation, confidence in learning, task value, control beliefs in learning, and effort regulation. All five SRL constructs were Z-transformed to share the same metric, so each construct contributed equally to the formation of clusters (Billieux et al., 2015).

There are two clustering techniques: hierarchical and non-hierarchical. The hierarchical clustering technique does not allow a data point reassigned once it is assigned to a cluster; the non-hierarchical clustering technique starts with the assumed number of clusters and reassigns the data to the clusters based upon its proximity (Kern & Culley, 2015). Researchers commonly use both techniques to identify the best number of clusters to support not only the theoretical framework but also the research hypotheses.

Likewise, we used both hierarchical and non-hierarchical clustering techniques to

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identify the appropriate number of clusters that would represent the data set genuinely. First, a hierarchical clustering analysis produced an agglomeration schedule that showed a number of solutions equal to the number of cases. Table 1 shows the agglomeration schedule for the final 10 clusters and the changes in a coefficient at each level. The largest change in the coefficient was observed moving 1 to a 2-cluster solution. However, fairly large changes were also observed when moving from 2 to 3, from 3 to 4, and from 4 to 5 cluster solutions. Thus, two, three, four, and five cluster solutions were adopted for the next analysis.

*Insert Table 1 about here.*

Second, non-hierarchical cluster analyses with *k*-means cluster analyses were conducted. Using repeated *k*-means cluster analyses, the four-cluster solution was chosen for a few reasons. First, our goal was to identify different levels of SRL; the two-cluster solution that dichotomized students' SRL only into two levels did not meet the goal. Second, with the three-cluster solution, the mid-level SRL was not clearly observed. Third, with the five-cluster solution, the number of students in one of the SRL levels was very small, which was very likely to constraint statistical comparisons. Table 2 presents descriptive statistics for the four-cluster solution. The values of each construct were standardized from 0 to 1, whereby a positive number means above the mean, and a negative number means below the mean (see Table 2).

*Insert Table 2 about here.*

The profiles of four SRL clusters are presented in Figure 1. Cluster 1 included students whose SRL levels were low. Students in this group showed that intrinsic goal orientation, confidence in learning, task value, control beliefs in learning, and effort regulation were below the mean. Cluster 1 was named "Low regulators." Cluster 2 included students whose confidence was above the mean, their control beliefs in learning and effort regulation were average, and their

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intrinsic goal orientation and task value were below the mean. The students were identified as making average efforts for learning. Cluster 2 was named "Mid-regulators with lacking values." Cluster 3 included students whose task value was above the mean, their confidence and control beliefs in learning were average, and their intrinsic goal orientation and effort regulation were below the mean. They were identified as not making efforts for learning. Cluster 3 was named "Mid-regulators with lacking efforts." Cluster 4 included students whose SRL levels were high. Students in this group showed that intrinsic goal orientation, confidence, task value, control beliefs in learning, and effort regulation were above the mean. Cluster 4 was named "High regulators."

*Insert Figure 1 about here.*

To test three hypotheses, we employed a one-way factorial design and conducted one-way ANOVA's to test each hypothesis. In the design, students' levels of SRL were a factor with four levels. The significance level was set at  $\alpha < .05$  for all analyses.

## **Results**

### **SRL Levels and Perceptions of Community of Inquiry (CoI)**

Means and standard deviations for CoI are presented in Table 3. One-way ANOVA's were conducted to examine whether individuals' SRL levels influenced their perceptions of CoI. The results revealed that SRL levels significantly affected students' perceived CoI (see Table 4): for teaching presence,  $F(4, 175) = 7.408, p < .0001$ , Eta squared = 0.112; for social presence,  $F(4, 175) = 5.043, p < .05$ , Eta squared = 0.079; and for cognitive presence,  $F(4, 175) = 10.249, p < .0001$ , Eta squared = 0.149. Students with high SRL perceived three presences more whereas students with low SRL perceived three presences less.

*Insert Table 3 about here.*

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*Insert Table 4 about here.*

Post-hoc tests using Tukey were conducted to examine how each SRL level affected perceived CoI. For teaching presence, significant differences were found between Clusters 1 and 3 ( $p < .05$ ) and also between Clusters 1 and 4 ( $p < .001$ ). For social presence, significant differences were found between Clusters 1 and 4 ( $p < .05$ ) and also between Clusters 2 and 4 ( $p < .01$ ). For cognitive presence, significant differences were found between Clusters 1 and 3 ( $p < .01$ ), between Clusters 1 and 4 ( $p < .01$ ), between Clusters 2 and 3 ( $p < .001$ ), and between Clusters 2 and 4 ( $p < .001$ ). In sum, the higher students self-regulated, the higher they tended to perceive cognitive presence, social presence, and teaching presence.

### **SRL Levels and Affective Outcomes**

Descriptive statistics for both affective outcomes (attitudes and self-efficacy) are presented in Table 5; ANOVA results in Table 6. First, a one-way ANOVA was conducted to examine whether SRL levels influenced students' attitudes toward technology integration. The results confirmed the positive relationship between SRL levels and attitudes,  $F(4, 175) = 3.756, p < .05$ , Eta squared = 0.06. Tukey post-hoc tests revealed a significant difference between Clusters 1 and 4 ( $p = .006$ ). This means that highly self-regulated students showed significantly more positive attitudes whereas low self-regulated students showed significantly more negative attitudes.

Next, a one-way ANOVA was conducted to examine whether SRL levels influenced students' self-efficacy beliefs in technology integration. The result confirmed the positive relationship between SRL levels and self-efficacy,  $F(4, 175) = 6.040, p < .01$ , Eta squared = 0.093. Tukey post-hoc tests revealed that there were significant differences between Clusters 1 and 3 ( $p = .035$ ) and also between Clusters 1 and 4 ( $p = .000$ ).

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*Insert Table 5 about here.*

*Insert Table 6 about here.*

## **Discussion**

In the community of inquiry (CoI) framework, many researchers have emphasized online instructors' roles for cultivating a positive CoI through teaching, social, and cognitive presences (e.g., Akyol & Garrison, 2011). Instructors' efforts (e.g., effective course design or the use of scaffolding strategies) have crucially affected students' perceived CoI (e.g., Garrison et al., 2010). Recently, some researchers have paid attention to self-regulated learning as a potential construct of CoI and debated the role of self-regulated learning in the CoI framework (e.g., Shea & Bidjerano, 2010 & 2012; Garrison and Akyol, 2015). The current study sought to clarify this matter and investigated the effect of students' SRL levels on their perceived CoI and their learning outcomes.

Our empirical results have clearly attested that SRL levels play a meaningful role for students' perceived community of inquiry. This is somewhat consistent with the assertion made by Shea and Bidjerano (2010; 2012). To reiterate, highly self-regulated learners in our study are likely to perceive higher teaching, social, and cognitive presences, compared to those who are low self-regulated. High self-regulated learners are those who had high intrinsic goal orientation, high confidence in learning, high control belief in learning, higher task value, and high effort regulation. We suspect that these learners can contribute to cultivating CoI because, presumably, their active participation promotes social presence, teaching presence, and cognitive presence. A previous study, finding that self-regulated learners interact with others actively and strategically, is in line with this conjecture (Cho & Jonassen, 2009). Since self-regulated learners engage in the learning process actively, they may also support teaching efforts by responding to the questions

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posted by the instructor or by seeking help from the instructor and their peers. Overall, we infer that understanding and developing students' self-regulatory efforts could meaningfully contribute to the development of positive learning community of inquiry in online classes.

Another important finding was that SRL levels influenced students' affective outcomes (i.e., task-specific attitudes and task-specific self-efficacy beliefs). Consistent with previous SRL research (e.g., Broadbent & Poon, 2015; Cho & Shen, 2013), the study showed positive relationships between SRL and student affect. Our study further revealed that the relationships were more strongly demonstrated between high- and low-self-regulated students. The mid-level SRL seem to be less related to students' attitudes, nor self-efficacy beliefs. One explanation might be that the course was offered at an introductory level that emphasized practical applications of educational technologies and motivation to use the technologies in classrooms. For this reason, the course materials were structured with clear organization and specific instructions. The learning tasks were not very difficult as long as students followed the instructions step by step. These instructional factors might lead the mid-SRL students to regulate their learning just at the right level where the students could equally achieve the affective outcomes. Future research is invited to examine the relationship of SRL levels and learning outcomes with more advanced, challenging tasks.

The cluster analysis identified four levels of SRL of the participants, i.e., low regulator, mid-regulator with lack of values, mid-regulator with lack of effort, and high regulator. Among the five constructs of SRL, intrinsic goal orientation, task value, and effort regulation seemed to play a determining role in differentiating the SRL levels. That is, mid-level regulators showed intrinsic motivation to learn the content below average overall. Then, the mid-regulators with lack of values showed task values below average whereas the mid-regulators with lack of effort

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showed effort regulation below average. This finding, perhaps, uniquely contributes to the SRL literature, in that the study has identified how each construct of SRL might play a role in the different levels of SRL.

To conclude, our finding presents clear evidence that a learner characteristic (i.e., SRL) has played an important role for the CoI framework, very likely affecting the formation of positive online learning community. It is recommended that instructors and designers use instructional strategies to promote students' SRL in order to develop positive learning experiences in online environments. Also, from the finding, it seems natural that learning presence be included in the CoI framework. We hope that future research continues to confirm our findings and establish broad evidence for this claim.

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Table 1

*Agglomeration Schedules for the Last Ten Clusters*

Number of clusters	Agglomeration coefficient (rounded)	Change in coefficient to next level (%)
10	339.360	4.4
9	355.085	4.5
8	371.848	9.1
7	409.078	8.4
6	446.883	9.7
5	495.055	12.2
4	563.890	12.0
3	640.940	13.6
2	742.034	17.1
1	895.000	-

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Table 2

*Descriptive Statistics for Four SR Clusters (N = 180)*

SRL	Cluster 1 (n = 34, 19%)			Cluster 2 (n = 24, 13%)			Cluster 3 (n = 48, 27%)			Cluster 4 (n = 74, 41%)		
	M	SD	z	M	SD	z	M	SD	z	M	SD	z
IG	4.81	0.69	-0.22	4.18	0.91	-0.92	4.53	0.76	-0.53	5.68	0.55	0.74
CON	4.80	0.67	-1.34	6.26	0.57	0.50	5.90	0.60	0.04	6.20	0.56	0.42
TV	5.80	0.46	-0.71	5.28	0.58	-1.49	6.57	0.38	0.44	6.63	0.43	0.53
CLB	5.35	0.50	-1.03	6.06	0.81	0.02	6.01	0.52	-0.06	6.39	0.53	0.50
ER	5.44	0.72	-2.65	5.76	0.64	0.03	5.24	0.71	-0.65	6.18	0.54	0.59

*Note.* IG = Intrinsic goal orientation, CON = Confidence in learning, TV = Task value, CLB = Control of learning beliefs, and ER = Effort regulation.

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Table 3

*Mean and Standard Deviations Comparing CoI By SRL Levels*

SRL Levels	<i>n</i>	Teaching Presence		Social Presence		Cognitive Presence	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
C1: Low regulator	34	5.74	0.67	5.06	0.96	5.44	0.97
C2: Mid-regulator with lacking values	24	6.08	0.71	4.90	1.26	5.17	1.46
C3: Mid-regulator with lacking effort	48	6.25	0.66	5.38	0.97	6.14	0.72
C4: High regulator	74	6.34	0.58	5.62	0.76	6.10	0.74
Total	180	6.17	0.67	5.35	0.97	5.86	0.97

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Table 4

One-Way ANOVA Summary Comparing Four SRL Level's Groups on CoI

	<i>df</i>	Sum of Squares	Mean Square	<i>F</i>	<i>p</i>
Teaching presence					
Between Groups	3	20.07	6.69	7.41	0.00
Within Groups	176	158.93	0.90		
Total	179	179.00			
Social presence					
Between Groups	3	14.17	4.72	5.04	0.00
Within Groups	176	164.83	0.94		
Total	179	179.00			
Cognitive presence					
Between Groups	3	26.62	8.87	10.25	0.00
Within Groups	176	152.38	0.87		
Total	179	179.00			

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Table 5

*Means and Standard Deviations Comparing Attitudes and Self-Efficacy by SRL Levels*

SRL Levels	<i>n</i>	ATTI		SETI	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
C1: Low regulator	34	5.91	0.79	5.94	0.78
C2: Mid-regulator with lacking value	24	6.29	0.67	6.25	0.42
C3: Mid-regulator with lacking effort	47	6.26	0.62	6.31	0.55
C4: High regulator	74	6.38	0.67	6.46	0.56
Total	180	6.25	0.70	6.29	0.62

*Note.* C = Cluster, ATTI = Attitudes toward technology integration, and SETI = Self-efficacy beliefs in technology integration.

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Table 6

One-Way ANOVA Summary Comparing Four SRL Level's Groups on Attitudes and Self-Efficacy

	<i>df</i>	Sum of Squares	Mean Square	<i>F</i>	<i>p</i>
Attitudes					
Between Groups	3	10.77	3.59	3.76	0.01
Within Groups	176	168.23	0.96		
Total	179	179.00			
Self-efficacy					
Between Groups	3	16.71	5.57	6.04	0.00
Within Groups	176	162.29	0.92		
Total	179	179.00			

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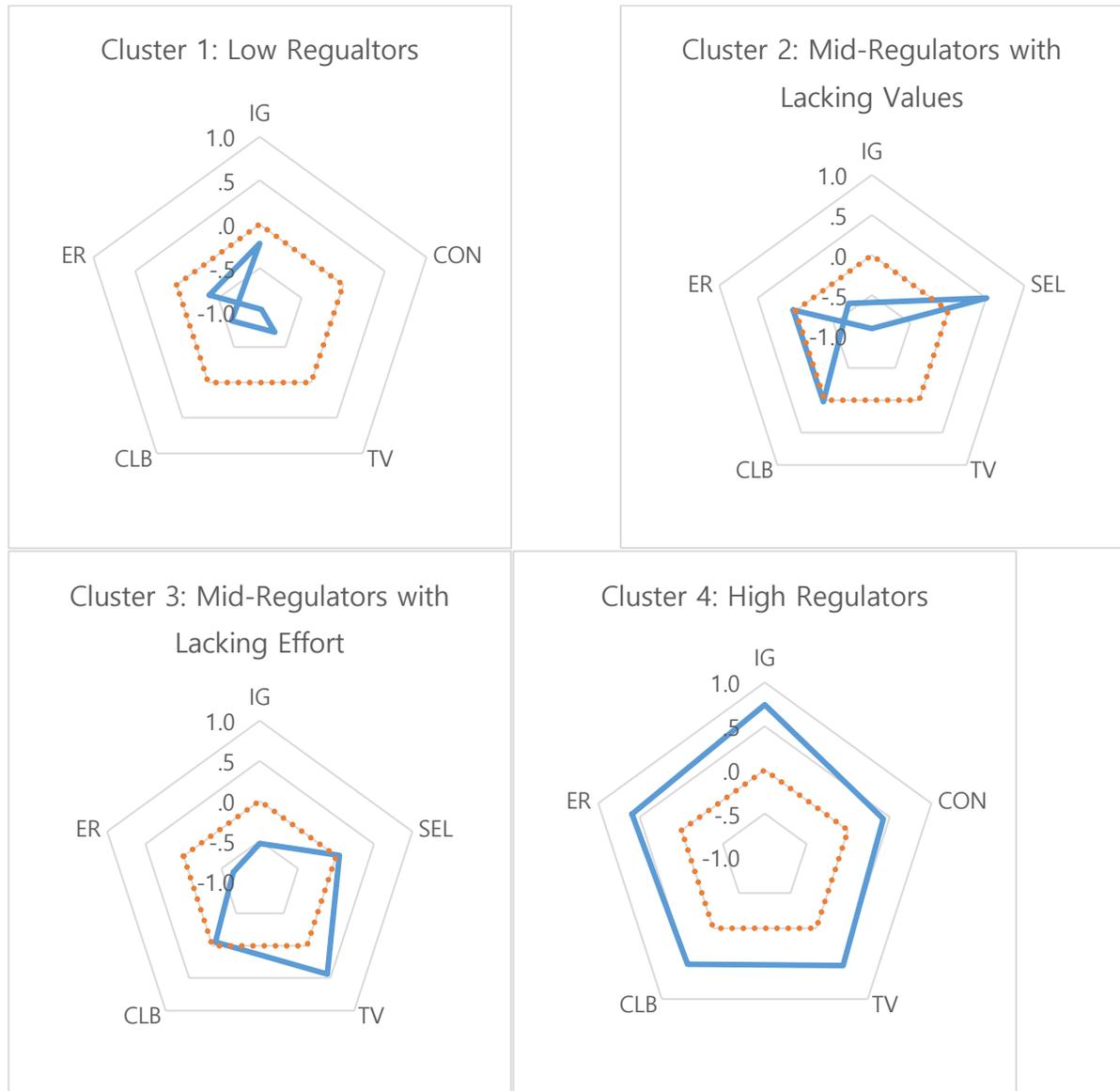


Figure 2. Profiles of the students' different levels of self-regulated learning. IG = Intrinsic goal orientation, CON = Confidence in learning, TV = Task value, CLB = Control of learning beliefs, and ER = Effort regulation. Dashed lines refer to standardized means (Z-scores) of the entire sample. Bold lines refer to standardized means for each specific cluster.

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## Appendix A. Survey Instrument

Self-regulated learning consists of five subscales adapted from the Motivated Strategies for Learning Questionnaire (MSLQ) (Duncan & McKeachie, 2005).

### Intrinsic goal orientation (n=4)

1. In a class like this, I prefer course material that really challenges me so I can learn new things.
2. In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.
3. The most satisfying thing for me in a course is trying to understand the content as thoroughly as possible.
4. When I have the opportunity, I choose course assignments that I can learn from even if I'm not sure I will get a good grade.

### Confidence in learning (n=4)

1. I believe I will receive an excellent grade in this online course.
2. I'm certain I can understand the most difficult material presented in this online course.
3. I'm confident I can do an excellent job on the assignments and activities in this online course.
4. I'm certain I can master the skills being taught in this online course.

### Task value (n=4)

1. I think I will be able to use what I learn in this course for classroom teaching.
2. It is important for me to learn the course material in this online class.
3. I think the course material in this class is useful for me to learn.
4. Understanding the topics in this course is very important to me.

### Control beliefs in learning (n=4)

1. If I study in appropriate ways, then I will be able to learn the topics covered in this course.
2. It will be my own fault if I don't learn the course topics.
3. If I try hard enough, I will learn more about educational technologies.
4. If I don't learn the educational technologies taught in this online course, it probably is because I didn't try hard enough.

### Effort regulation (n=4)

1. I often feel so lazy or bored when I study that I quit before I finish what I planned to do. (reverse coding)
2. I work hard to do well even if I don't like what we are doing.
3. When the course work is difficult, I either give up or only study the easy parts. (reverse coding)
4. Even when course materials are dull and uninteresting, I manage to keep working until I finish.

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Community of inquiry (adapted from Arbaugh et al., 2008)

Social presence (n=7)

1. In general, I felt connected with others in the course.
2. I felt I was encouraged to engage in the learning activities.
3. Online communication is an excellent medium for social interaction.
4. I felt comfortable conversing through the online medium.
5. I felt comfortable participating in the course discussions.
6. I felt comfortable posting questions.
7. I felt comfortable disagreeing with other course participants.

Cognitive presence (n=6)

1. The topics stimulated my interest in the course.
2. Course activities stimulated my curiosity about the weekly topic.
3. I was given ample opportunities to learn.
4. I have learned a lot in this course.
5. I felt motivated to explore course related topics.
6. I can apply skills developed in this course to my work.

Teaching presence (n=10)

1. The instructor clearly communicated important course topics.
2. The instructor clearly communicated important course goals.
3. The instructor provided clear instructions on how to participate in course learning activities.
4. The instructor clearly communicated important due dates and time frames for learning activities and assignments.
5. My instructor presented helpful examples that allowed me to better understand the content of the course.
6. My instructor clearly explained the content of the course.
7. The instructor helped keep me on task.
8. The instructor encouraged me to develop new skills in this course.
9. The instructor was responsive to my questions.
10. The instructor cared about my learning.

Attitudes toward technology integration (n=9) (Adapted from Sang et al, 2010)

1. Using computers provides new opportunities for improving learning.
2. Using computers helps students learn better.
3. Using computers can help me learn more efficiently.
4. Using computers can increase student motivation

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5. Using computers can promote student creativity.
6. Developing computer knowledge and skills should be more integrated into the curriculum in schools.
7. Using computers can help the teacher to personalize instruction.
8. Using technology can enhance a student's motivation to learn.
9. Integrating technology will be a trend in the future in education.

Self-efficacy beliefs in technology integration (n=9) (Adapted from Wang et al., 2004)

1. I am confident that I understand the capabilities of computers well enough to use computers effectively in my classroom.
2. I am confident that I have the skills necessary to use computers for classroom teaching.
3. I am confident I can use educational technology in an effective way.
4. I am confident that I can teach relevant subject content by means of appropriate use of technology.
5. I am confident I can incorporate technology into my lessons when appropriate to student learning.
6. I am confident I can guide my students in the appropriate use of technology.
7. I am confident I can effectively monitor the computer use of my students in my class.
8. I am confident in assigning and grading technology-based projects.
9. I am confident in selecting an appropriate technology tool for instruction.