

The relationship between self-directed learning and students' social interaction in the online learning environment

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Abstract

In the online learning environment, learners play an important role in attaining successful learning. Considering the students' self-directed learning is important to university because of online learning is done in unlimited space and time. Through online mode, the learners do the social interaction. The interaction in online learning is categorized into four dimensions namely the interaction between the teachers and students, students and students, teachers and topic, and students and topic. This study emphasized the relationship between self-directed learning and students' social interaction in the online learning environment. Statistical associations between variables were inspected with parametric correlation and statistically significant differences between independent samples were examined with a one-way analysis of variance. This study showed a significant relationship between students' self-directed learning readiness (SDLR) and their social interaction, and there were different social interactions between students based on their SDLR levels.

KEYWORDS: Online Learning Environment, Self-directed Learning, Social Interaction, Intensity, Quality

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1. Introduction

In recent years, the learning environment has changed due to the rapid development of the internet and information technology. The interaction between teachers and learners is continually enriched and changed because of explosive development in the technology of computers and the internet. Online learning environment (OLE) has dynamically developed over the world giving many chances for independent learning and collaboration in unlimited space and time. The online learning system offers easy access to the domain of knowledge and learning process

anywhere, for anyone, at any time. Through online, the learners can also access much information and many resources such as books, videos or web pages including technological tools or systems used to create a collaborative environment. Many online learning environments have been developed to support learning and assessment or evaluation (Deperlioglu, Sonugur & Suzme, 2015). The use of the OLE applications provide many facilities supporting the process of sharing, negotiation, and discussion beside done in the face to face class setting (Hadjileontiadou, Dias, Diniz & Hadjileontiadis, 2015). Therefore, Milicevic and colleagues (2017) stated that online learning becomes a real alternative to augmenting the traditional classroom.

In an online learning environment, learners play an important role in attaining successful learning (Morris, 1995; Shaikh, 2013). Some of the factors that influence the success of online learning include student technical skill namely computer literacy, independence in learning, interaction in learning, and flexibility in content (Picciano, 2002). However, considering the students' self-directed learning is important because online learning happened in unlimited space and time. Previous studies have shown that self-directed learning

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readiness or the ability to manage self-learning is more significant (Guglielmino & Guglielmino, 2001; Morris, 1995; & Shaikh, 2013). The individual's knowledge and attitude give a good foundation to learn independently. In addition, attitude and skill will create the students' positive behaviors to succeed in online learning (Guglielmino & Guglielmino, 2002). If the learners are ready for online learning, the learning process will be an efficient and effective approach (Guglielmino & Guglielmino, 2003). Otherwise, the learners will do unstructured learning and, in the end, get failures in the learning process.

Today, schools and institutions learnt the importance of self-directed learning (SDL) skill. It is considered as an indicator of learning outcome that is necessary in the 21st century (Murnane & Levy, 1996). SDL is "a process where an individual takes an initiative with or without the others' help" to diagnose their learning needs, formulate the learning goal, identify the learning resources, choose and apply the learning strategy, and evaluate the learning outcome (Knowles, 1975; 1990). Therefore, the teachers and students should have not only academic skills but also SDL skills (Aregrado, Bradley & Lane, 1996).

Self-directed learning is beneficial to stimulate motivation, and self-control since online learners are expected to be able to learn without an instructor (Skaggs, 1981). Many researches have been conducted to measure the level of students' self-directed learning in online learning by using self-directed learning readiness (Saks & Leijen, 2014; Kovalenko & Smirnova, 2015; Cazan, & Schiopca, 2014). Another study found that students may have SDL until a certain level (Shaikh, 2013). Most of the literature (for instance, Bernard et al., 2000; Clark & Mayer, 2002; Broadbent, 2016) agreed with Guglielmino (2003) in considering the self-directed learning readiness (SDLR) as an essential factor in online learning. The level of self-directed learning readiness in using online technology is very significant to reach academic success as well. In this case, self-directed learning readiness is defined as the learner's readiness to learn independently. Regarding this case, Cazan and Schiopcal (2014) found that self-directed learning correlates to the students' learning outcomes. According to Saks and Leijen (2014), self-directed learning due to its adult education roots is mostly used for describing the learning activities outside the traditional school environment and involves the aspect of designing learning environments. The high relevance of self-directed learning in today's educational discourse would suggest that the term is precisely defined and used in literature. To facilitate a learning environment in which students can acquire a necessary level of understanding, it is necessary to apply an active learning paradigm, which recognizes that student self-

directed and interaction is critical to the learning process (Jeremić et al., 2011).

The online learning environment requires students' engagement in the online system. The OLE applications provide many facilities supporting the process of sharing, negotiation, and discussion besides done in the face to face class setting (Hadjileontiadou et al., 2015). Through online mode, the learners can also create a collaborative learning process. Moreover, McLoughlin & Lee (2010) stated that teachers who adopt social software tools should not do so merely to appear conversant with the tools but to ensure integration of the tools with sound pedagogical strategies to facilitate authentic exchange and dialogue with and amongst students. Students with a certain level of SDLR will engage in a learning process (Saks & Leijen, 2014).

This study will reveal in more detailed the effect of SDLR on social interaction in OLE. Figure 1 shows the plan of our investigation with an emphasis on two main elements: SDLR, and social interaction. Social interaction can be described as a subset of online learning environment, that is students' activities in an online learning environment, then an online learning environment is a subset of the learning process. Students' SDLR as a variable of student's characteristic that expect the students' activities in OLE.

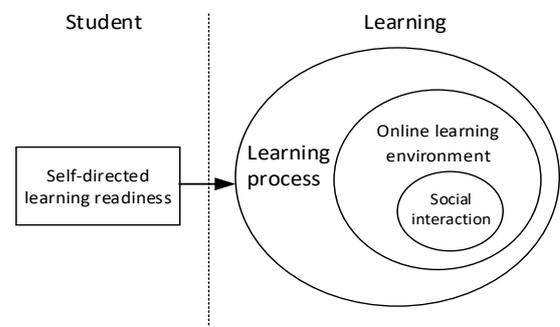


Figure 1 - Point of view of SDLR, learning process, OLE, and social interaction.

This study focuses to examine the relationship between SDLR and social interaction in an online learning environment. The main objective was to examine whether and how self-directed learning readiness is related to student's social interaction in OLE. According to Kožuh and colleagues (2015), social interaction refers to a reciprocal relationship between two people or more. Garrison & Anderson (2003) stated that there are four interactions in education namely interaction between teacher and students, student and student, teacher and topic, and students and topic. In this study, the intensity and quality of social interaction are related to academic achievement but there is no

relationship between social presence and academic success. This case is in line with the finding of Picciano (2002) stating that there was no correlation between social presence and final exam outcomes. Otherwise, there was a strong relationship between social presence and the students' performance in writing.

Regarding this case, Kožuh and colleagues (2015) has investigated the relationship between social interaction and the student's academic success in the personal learning environment. They have evaluated the proposed concept in a classroom setting, using a specific social interaction tool and a specific social presence tool. The findings revealed that although the use of the social interaction tool was positively associated with students' academic success, the perceived ease of using the social presence tool was negatively related to students' success, unfortunately, this study doesn't consider the students' characteristic that is also probably affected to their social interaction in the online learning environment.

Therefore, we propose integrating SDLR as students' characteristics into an analysis of the student's social interaction in online learning environments. We focused on the relationships between two main elements of the student's social interaction: the intensity of social interaction and the quality of social interaction.

We identified the following research questions to be examined:

RQ1. *Is there a relationship between SDLR and the intensity of social interaction in the student's online learning environment?*

We expect to find a positive relationship between these variables, anticipating that the more intensive the students' social interactions are, the better their success will be.

RQ2. *Is there a relationship between SDLR and the quality of social interaction in the student's online learning environment?*

We expect to find a positive relationship between these variables, anticipating that if SDLR increases, students' quality of social interaction will also improve.

RQ3. *Is there a relationship between the intensity of social interaction and its quality in the student's online learning environment?*

A positive association is also expected to be found in answering the third research question. We assume that as the intensity of social interaction increases, its quality will also increase.

RQ4: *Are there statistically significant differences between student groups with a higher SDLR and student groups with a lower SDLR in the intensity of social interaction?*

It is expected that the intensity of social interaction will differ between student groups according to the student's SDLR. We assume that the members of a student group with a higher SDLR will report higher mean scores in the intensity of interaction than students with a lower SDLR.

RQ5. *Are there statistically significant differences between student groups with a higher SDLR and student groups with a lower SDLR in the quality of social interaction?*

It is expected that the quality of social interaction will differ between student groups according to the student's SDLR. We assume that the members of a student group with a higher SDLR will report higher mean scores in quality of interaction than students with a lower SDLR.

2. Materials and Methods

2.1 Participants

The participants in this study were 98 students (52 male, 46 female) of Education Faculty, State University of Malang Indonesia, who attended online learning as the samples selected randomly. Before the experiment, we examined their self-directed learning readiness (SDLR) and they should attend a few-hour training courses where the main features of the system were presented. We classified them into two groups namely high levels of SDLR and low level of SDLR. The sizes of the groups were based on their SDLR scores.

2.2 Instruments

The measuring instruments were classified into two groups: (1) scale and (2) server log files. Scale was used to collect self-directed learning readiness. We also analyzed a dataset of the server log files to define the intensity and quality of social interaction. In this way, the results from the questionnaires were elaborated with research findings from the server log files analysis.

2.3 Self-directed learning readiness scale (SDLRS)

Assessing the self-directed learning adopted from the self-directed learning readiness scale (SDLRS) developed by Guglielmino (1989) was to measure the students' self-directed learning readiness. This SDLRS consisted of 38 items to assess the students' SDLR. Each item has 5 points-Likert scales with the description namely "1 = I am almost never right", "2 = I am usually wrong", "3 = I am sometimes right", "4 = I am always right", "5 = I am almost always right". The summation of all 38 items scores would be similar to SDLRS total scores. This scale consisted of 34 items stated positive and 4 items stated negative used to avoid the same answer among students (Guglielmino, 1989).

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All SDLRS scores were employed to represent the students' SDLR. The validity and reliability of the students' SDLR were supported by some research. According to Guglielmino (2008), SDLRS was assessed by Finestone (1984) and Wiley (1981) to know the reliability of test-retest and reach the high test-retest reliability score of 0.82 (Finestone, 1984) and 0.79 (Wiley, 1981). SDLRS also could read the reliability coefficient above 0.70 minimum for all subscales in the instrument (Boden, 2005). This showed that SDLRS has high reliability. Besides, SDLRS had a significant correlation with the SDL level (Finestone, 1984; Skaggs, 1981), preference of challenge, curiosity to learn, and scholastic competency felt (Posner, 1989). This showed that SDLRS had a high validity to assess the participants' SDL.

2.4 Students' social interaction

To reach the goal of this research, the scores of the students in online discussion for the subject of Mobile Learning were accumulated at the end of the second semester. We measured two separate elements: the intensity and the quality of social interaction. Two different categories of forum posts were considered adopted from Vuopala and colleagues (2016), namely the interaction related to the group and interaction related to the task.

The first category included the interaction related to the group:

1. Answer or comment:
 - Declarative comment, rule: agrees, states, repeats;
 - Comment with an explanation, rule: explains, justifies, clarifies;
2. Socio-emotional expression:
 - Expressing cohesion, rule: helping, rewarding, acknowledging;
 - Accompanying: mumbling topics that are not related to the course content or group work.

Each post was assessed by the teacher by considering the significance of the posting raised by the student, according to the given task and providing another

possibility of the question being answered by other students and by the teacher.

The second category comprised discussion forum posts where the interaction is related to the task:

1. New knowledge:
 - Theory-based, rule: bring a new topic based on the theory of the source of information;
 - experience Based, rule: bring a new topic based on the experience or opinion;
 - Statement, rule: bring new topic as a statement without explanation;
2. Question:
 - New question, rule: brings a new question into the discussion;
 - Clarifying question, rule: clarifying the previous question or asked for clarification;
 - Suggestion, rule: states or suggests and wait for comments.

The intensity was measured as an average number of discussion forum posts per student in each group. Students engaged in six forum discussions. Table 1 shows the number of discussion posts of student.

The quality of the student's social interaction was defined by the teachers' assessment of students' discussion forum posts in the students' online learning. The teacher assigned a mark on a scale of 0 to 5 for each post. The mark 0 was assigned if no post was published by the student and the mark 5 was assigned to an excellent post.

The assessment of these posts was also based on the significance and technical correctness of the posts from the viewpoint of the task content; the factor of predicting how relevant the post was for its ability to guide the user to a proper solution was considered as well. The teacher's marks for the discussion forum posts were summed up for each group of students. The results were divided by the number of posts in the group, then the average mark of posts per group was computed.

2.5 Procedure

The experiment was conducted at the State University

Students' forum posts in OLE	Discussion forum					
	I	II	III	IV	V	VI
Interaction related to the group:						
Answer or comment	2	1	1	2	2	2
Socio-emotional expression	1	2	0	1	2	2
Interaction is related to the task:						
New knowledge	1	1	2	1	1	2
Question	0	3	2	2	2	1
Suggestion	1	0	1	1	2	0
Total	5	7	6	7	9	7
Mean	6.83					

Table 1 - Intensity score of social interaction of students.

of Malang Indonesia and was performed in four steps: (1) assessment of the students' SDLR, (2) demonstration of using the online learning system along with a training session, (3) working with the online learning system, and (4) assessment of the student's social interaction in the online learning environment.

In the first step, the participants filled in the questionnaire to assess the self-directed learning readiness. In the second step, we demonstrated the system's functionalities during a training session where an example of the assignment was introduced. The participants were informed about the evaluation criteria to become aware of the teacher's expectations regarding their activity in the online learning environment.

The third step included the main experiment. The teacher gave each group its tasks. The tasks were topics of discussion, and assignment. The online learning environment systems used the Moodle Learning Management System. Although all members within each group received the same tasks, they were asked to submit their solutions. The assigned task was complex and challenging so that it could elicit a constructive learning process in students (Van Merriënboer & Paas, 2003). Learning process design in OLEs has its roots in various theories. The proposed opportunities for communication are related to the Social Learning Theory (Bandura, 1977) and collaboration (Dillenbourg, Baker, Blaye & O'Malley, 1994), referenced together as social interaction learning theory, where social interaction is a crucial element in learning. In the fourth step, throughout the course, the teacher was fully engaged in the students' learning process and available 24 hours a day.

2.6 Statistical analyses

The internal consistency reliability of a set of items for one variable was checked with the Cronbach's Alpha coefficient (Cronbach, 1951). Statistical associations between variables were inspected with parametric correlation (Pearson's correlation coefficient).

Statistically significant differences between independent samples were examined with an analysis of variance (One-way ANOVA) statistical model and a parametric correlation (Howell, 2002). All analyses were performed using Statistical Package for the Social Sciences (SPSS) version 23.0 software.

3. Results

Table 2 presents observations of students' SDLRs.

	N	Range	Min.	Max.	Mean	SD
SDLR	98	80	98	177	140.36	16.18

Table 2 - Descriptive statistics of SDLRs.

The student's SDLR score was categorized into two-level: *High* (if SDLR \geq mean), and *Low* (if SDLR $<$ mean). We found 47 students with a low level of SDLR and 51 students with a high level of SDLR, from a total of 98 students. Considering the equality of group, 47 students with a high level of SDLR engaged in this online learning. The total participants of online discussions in OLE were 94 students.

Table 3 shows the mean scores of these variables for student groups, using descriptive statistics. The students in group High level of SDLR reported the most intensive social interaction ($M = 9.85$) and also reached the highest quality level of social interaction ($M = 3.49$, $SD = 0.38$).

Student		Social interaction			
Group		Intensity		Quality	
SDLR	Number of Students	Mean	SD	Mean	SD
Low	47	7.72	3.21	3.18	0.20
High	47	9.85	3.15	3.49	0.38

Table 3 - SDLR and intensity and quality of social interaction.

A parametric correlation analysis was conducted to further investigate the first three research questions. A statistically significant positive relationship was found between the SDLR and the intensity of the social interaction, $r = 0.281$, $p < 0.01$. Likewise, a statistically significant relationship was demonstrated between the quality of social interaction and SDLR, $r = 0.432$, $p < 0.01$, meaning that as the SDLR improved, their quality of social interaction in the online learning environment also improved.

Also, a statistically significant positive relationship was found between the intensity and the quality of social interaction, $r = 0.693$, $p < 0.01$. It indicates that as students were more active in discussion forum postings in the online learning environment, the quality of their posts improved.

Considering student groups with different levels of SDLR concerning using the social interaction tool in OLE, we analyzed with one-way ANOVA to detect statistically significant differences between student groups in all variables.

The results demonstrated statistically significant differences between the groups in the variable "intensity of social interaction", $F = 10.509$, $p < 0.05$. Likewise, statistically significant differences were found in the variable "quality of social interaction", $F = 24.542$, $p < 0.01$.

For the fourth and fifth research question, we found that there were statistically significant differences between student groups with a higher SDLR and student groups

with a lower SDLR in intensity of social interaction and there were statistically significant differences between student groups with a higher SDLR and student groups with a lower SDLR for quality of social interaction.

4. Discussion and Conclusions

4.1 Discussion

This study found a significant relationship between students' SDL and their online performance measured by social interaction scores. This finding is in line with the conclusion of Hsu and Shiue (2005), Morris (1995), and Harriman (1990). From the results, it can be concluded that students are dependent on themselves in the online learning environment and they may have a possibility for greater academic achievement. To include the proper learning strategy to fulfill the students' needs, the university should not only assess their academic skills by selection (especially new students) in online learning but also use SLDR as the clarification variable.

According to Gibbons (2002), self-directed learning is the improvement of knowledge, expertise, achievement, and self-development where an individual uses many methods in many situations. Self-directed learning needed since it could give the students the ability to do the task, combine the skill development with character development and prepare the students to learn the whole of their life. Self-directed learning includes how the students learn every day, how the students could adapt to the very fast-changing, and how the students could take self-initiative when there is no chance. According to Kovalenko and Smirnova (2015), self-directed learning is a sequence of students' activity models individually or in a group in the class or at home without the teacher's involvement. Considering the relationship between SDLR and online learning activity, a study was found that online learning contribution to learning success is about 50%.

Therefore, online learning can be much more effective than other single direction, passive learning methods. There is a growing interest in online learning all over the world (Deperlioglu et al., 2015).

Kožuh and colleagues (2015) found the intensity and the quality of interaction were related to the learning outcome. According to Choy and colleagues (2016), in an online learning environment where learners and instructor are separated by space and time, creating proper structure (i.e., design) and developing meaningful interaction (i.e., online discussion) are hailed as the fundamental element in generating a strong sense of learning community.

Self-directed learning is being important to direct students to positive behavior supporting the success of

the learning process. Self-directed learning enables the students to adopt the right behaviours and managed themselves to have discipline in the learning process. Likewise, in the online learning environment, self-directed learning is needed to make students have a responsibility in managing and make themselves discipline.

4.2 Implications

This study revealed that considering SDLRs before student engagement in online learning is important. This information is useful to prepare the appropriate online learning mode to support the student with different SDL levels that enable to improve the academic achievement. Besides, it will have implications for the selection of features that will be used in an online learning environment.

These results of the study will add more research themes on the factors predicting academic success in online learning among university students. Despite the online learning technological system that may have a positive effect on learning, many empirical studies have found that some factors that could influence the intention to use the technology give an impact on the learning effectiveness as well. This factor could be a point of view on the future works. The intended factors are user's perception of the use of a certain technology such as the easiness and the user's attitude in using technologies. Moreover, learning preference in using a certain technology is also essential to assess the success of online learning (Hsu et al., 2015). Concerning SDL, providing options for students and encouraging students to adapt to their needs is the ideal approach for educators. However, lecturers must clearly explain the options and some students might need support in choosing modes that will maximize their learning. University administrators should be aware of the patterns of access so they can ensure degree programs allow for the flexibility students need, as well as providing up-to-date technology and adequate support to faculty and students. More courses are taking a blended learning approach, where online resources (not just lecture recordings) complement face-to-face techniques, and universities in the future will need to continue to innovate (Chapin, 2018).

4.3 Limitations

This study focused on SDLR and social interaction. Whereas there are still several factors that influence the success of online learning, including learning styles, cognitive load, etc. This study is limited in several aspects that must be addressed in future research. First, SDLR was not confronted with the students' academic success. Accordingly, future research shall include experimental settings in which learning designers use

analytics results for advancing online learning environments after learning topics are completed. Second, due to limited access to student data (e.g., learning styles, cognitive load, prior knowledge), a more holistic perspective to design the online learning environment of individual students and their relationship is important. Hence, future studies shall link additional student data and therefore provide further insights into these complex relationships.

4.4 Conclusions and future work

This study revealed the relationship between self-directed learning and students' social interaction in the online learning environment. This study found that there was a significant relationship between self-directed learning and students' interaction in the online learning environment and there were significant differences in students' interaction in online learning environment based on their level of self-directed learning readiness. Therefore, self-directed learning readiness is recommended to be one of the factors contributing to higher academic achievement in the online learning environment. Considering the self-directed learning readiness in the online learning process may be beneficial for the students to be successful in the online learning environment. Further research can assess self-directed learning readiness in the other universities by considering the other variables such as gender and different prior knowledge. The current research findings provide clues as to how the university to carefully design and develop the online learning process or integrate self-directed learning readiness to curriculum and online learning environment.

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