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Exploring Learners' Strategies of Self-Regulated Learning Abilities in a Novel MOOC Platform : eLDa

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Abstract

A capacity for self-regulated learning (SRL) has long been recognised as an important factor in successful studies. Although educational researchers have started to investigate the concept of SRL in the context of online education, very little is yet known about SRL in relation to massive open online courses (MOOCs) or of appropriate strategies to foster SRL skills in MOOC learners. Self-regulation is particularly important in MOOC-based study which demands effective independent learning and where widely acknowledged high dropout rates are observed. This study reports an investigation of the concept of SRL using a novel MOOC platform (eLDa). By providing study options (either via a self-directed learning or instructor-led learning) using a novel learning tool. In view of this, the research presents general description of self-regulated learning and explored the various existing dimensions used to expose the learners SRL skills. A non-parametric testing analysis was conducted to interpret the probability of our predicted null hypothesis. Drawing comparison of the online tool the results and findings of the data were analysed. The study discusses how the various dimensions contributed to the knowledge representation of the self-regulated learning abilities shown by the learners. We present how these SRL dimensions captured using the measuring instrument contributes to our growing understanding of the distinctive features of the individual learner's self-regulated learning. MOOCs success required a high performance of self-regulated learning abilities which at the moment very little has shown these degree of supporting SRL skills. This paper presents preliminary evaluation of a novel e-learning tool known, as 'eLDa' developed to implement this investigation of self-regulation of learning. We predict equal higher SRL skills among the participants, because of the fact that most of our learners are highly educated, professional, graduates and un-dergraduate. However, that is not the case with this study, our investigation reveals some aspect of low self-regulators observed in some dimensions including help-seeking and task strategies. This demonstrates that even learners of higher educational background may not be able to fulfil all the requirements necessary to be (or of been) called a high self-regulator and may need to improve in some

of the strategies (or dimensions) lacking. The research applied a modified online self-regulated learning questionnaire (OSLQ) as the instrument to measure the SRL skills. The OSLQ was developed with a 19-item scale questions that exposes the six SRL dimensions used in this study. This research is of imperative and impeccable value to the establishment and encouragement of self-regulated learning in MOOCs and also on the evaluation of the learners' cognitive ability in developing these skills.

Keywords: self-regulated learning, self-directed learning, instructor-led learning, learning patterns, MOOCs

Introduction

Online education systems such as massive open online courses (MOOCs) with an open environment have grown around the globe and have been broadcasted widely. Nonetheless, many participants who registered for these courses are not completing them and thus it led to the high dropout rates publicised in papers and the media. The low accomplishment rates of less than 15% completion rates have been recognised as one of the main difficulties within MOOCs (Jordan, 2013). MOOC participants represent large online learning communities with distinct motivational interest. Research shows that one of the causes of the low completion rate in MOOC could be due to the lack of motivation and procrastination within the learners to self-regulate and engage consistently with the course (Barnard et al., 2009). It has been known that learners who exhibit the ability to self-regulate their learning perform better academically as compared to learners with non or minimal self-regulated learning skills (Barnard et al., 2008; Barnard-Brak et al., 2010).

This research described the self-regulated learning ability identified among different learners' modes of study. The two main modes are: self-directed and Instructor-led modes. The study focuses on examining and investigating whether there exists better performance of self-regulated learning strategies among the learners from related study mode. In order to investigate the self-regulated learning dimensions, a novel 'eLDa' tool was developed to deliver a course in 'Python programming, computing concepts and how to teach computing in schools'. This study introduces this novel approach of learning which aims to allow learners to actively study in their own chosen path, and also providing the framework of an instructional direction to support participants in order to set-goals and to gain access to materials suitable for their own needs. The paper is organised as follows, firstly a review of background of self-regulated learning. Secondly, we present discussion of the various research methods applied in the research. Thirdly, we present preliminary results from our findings. Finally, we then present the research contribution, the conclusion and further direction.

Background of Self-regulated Learning

At one point or the other we have all observed self-regulated learning during our studies and careers. According to Barnard-Brak et al. (2010), self-regulated learning refers to volitional behaviours on individual learners part to succeed

in their learning. Those behaviours include but are not limited to the following: setting up study goals (goal setting), strategising effective ways of solving the task given (task strategies), planning an effective managing study time (time management), deciding on location of study to acquire optimum benefit with low distractions (environment structuring), requesting for assistance from peers and tutors in providing help in area of concern (help seeking) and lastly self-reflection on personal studies to evaluate the goals achieved (self-evaluation). SRL allows learners to approach educational tasks with confidence, diligence and in a resourceful manner Fuchs et al. (2003); Puustinen and Pulkkinen (2001).

Zimmerman (1990) explains that self-regulated (SR) learners are knowledgeable and aware of when they are confident on a particular fact and when they possess the skills to resolve the task successfully and also they are aware of when they cannot. On the other hand, unlike passive learners, SR students or learners are known to be proactive seeking out the necessary information needed, and then further develop personal steps to master it. These SRL learners always find a way out of any difficult situation (or obstacle) during their studies and learning processes in order to succeed. In a similar way, SR learners view learning acquisition as a systematic and controllable learning process. The learners accept responsibility for their outcomes and attainment (Borkowski et al., 1990; Zimmerman and Pons, 1986; Zimmerman and Martinez-Pons, 1990). SR learners are known to be self-starters with extraordinary confidence, they are highly persistence during their studies. They choose environment that will help them optimize their learning approach (Henderson, 1986; Wang and Peverly, 1986; Zimmerman and Pons, 1986). SR learners seek sufficient information and advice on environment they are most likely to concentrate and learn effectively. According to some studies, SR learners self-direct their knowledge acquisition and self-reinforce during performance enactments (Diaz et al., 1990; Rohrkemper, 1989).

When defining SRL, it is imperative to distinguish it from self-regulation processes such as self-efficacy and dimensions (or strategies) which were created to optimize the processes, such as intermediate goal setting, task strategies, time management, environment structuring, help-seeking and self-evaluation as adapted for this study (Barnard et al., 2008, 2009). In another definition, SRL is defined as a self-oriented feedback loop (Carver and Scheier, 2012; Zimmerman, 1989a). This loop involves a cyclic process which allows the students to monitor the effectiveness of their learning strategies and react to the feedback in a variety of ways, such as changing their self-perception in order to alter their learning behaviour strategies (Puustinen and Pulkkinen, 2001). Although this involves the learners showing proactive effort and be vigilant in allocating enough time in preparation in order to initiate control and self-regulate their learning (Zimmerman, 1989b). McCombs view was different, as they view learners as been motivated by an excellent 'sense of self-esteem or self-actualisation' (McCombs, 1989). Other theorist such as self-efficacy, achievement success and cognitive equilibrium favours motives of self-regulated learning (Zimmerman, 1990; Schunk, 1984, 1989). SR learners self-initiate personal activities in order to promote self-observation, self-evaluation, reflexivity in learning, and improvement which could be seen in practice sessions, specialty training and competitive activities (Zimmerman and Pons, 1986). Bandura (1989) described the ability of the learners to set higher learning goals for themselves after they have achieved initial goals, shows that they possess the quality of self-motivation.

SRL involves proactive efforts to seek benefits from the learning process. In this case, the learners are not only self-directed in a metacognitive manner, but also are self-motivated by using integrated skills of self-regulations (McCombs and Marzano, 1990). In summary, self-regulated learning has been categorized into three main features: (a) the learners use of self-regulated learning strategies or dimensions, (b) the learners responsiveness to self-oriented feedback on learning effectiveness, and (c) the learners independent motivational strategies which were used to achieve desired academic outcomes by incorporating responses of learning effectiveness and SRL skills (Zimmerman and Martinez-Pons, 1990).

Research Methods

Overarching Research Methodology and processes

This study uses design science research methodology as the overarching research methods (Von Alan et al., 2004). The data processes were in a combination of mixed methods of qualitative and quantitative methods. The data collection process in the study was done using questionnaires created with an excerpt instrument from Barnard et al. (2009, 2008). The data was further analysis using statistical analysis after the coding and categorization of the 19-item questions into six SRL strategies (or dimensions). The conceptual framework and the processes of the research methods are illustrated in Figure 1.
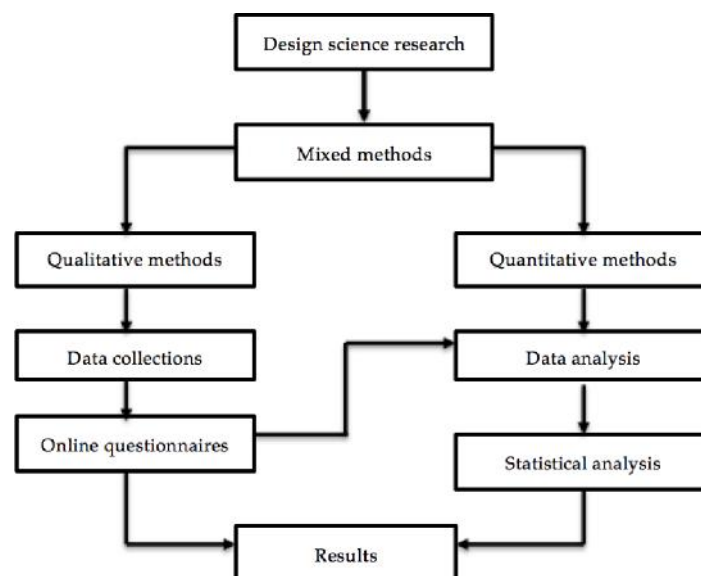

Figure 1: Conceptual framework of the research methodology

The eLDa Tool

Research has shown that learners with good knowledge on how to self-regulate their studies perform better than those with less ability to do so (Cunningham and Billingsley, 2002; Zimmerman and Pons, 1986; Zimmerman, 2002). It has been observed that the use of self-regulated learning ability is distinctive to the learner. Although the learners to suit their needs construct many SRL abilities such as goal setting and task strategies, the learning mode and direction chosen by the learners are to help them obtain optimum benefit from the online course. A novel platform, known as 'eLDa', was created to explore the approach and analyse the effects of novel features in order to encourage motivation, support and to foster self-regulation in learning. eLDa is implemented in Wordpress content management system (CMS) with plugins to support the novel features which allows the learners to choose their route to follow in the course in order to attain their own learning objectives or follow the directed path led by the instructor in order for the learners to achieve the course goals. The choice of Wordpress as CMS is imperative as it allows us to build a learning platform to support learners' chosen routes and to meet our research objectives. This platform supports two basic modes of learning: self-directed and instructor-led in which a recommended prerequisites order of lessons helps to cover the full course curriculum (Onah and Sinclair, 2015).

Participants

This study consists of a total of 107 registered participants at the beginning of the online course. Of the enrolled learners in this course, 45% (n=48) have indicated interest by engaging at least once during and after registration. However, only 27 active participants engaged with the course pre-entry survey. For the self-regulated learning survey questions, only a sample size of 11 learners out of the active participants completed the OSLQ used in this research. Approximately 59% of the active participants identified themselves as male (n=16) while 41% identified as female (n =11).

Data collection processes

The data collection process was obtained using an existing instrument known as 'online self-regulated learning questionnaire' (OSLQ), which was used for measuring self-regulated learning dimensions (Barnard et al., 2009, 2008). A 19-item scale with 5-point Likert-type response format which constituted values ranging from 5-strongly agree to 1-strongly disagree, was applied to collect learners' responses in order to evaluate and answer the research questions. The OSLQ was conducted using existing strategies such as: goal settings, environment structuring, help seeking, time management, task strategies, and self-evaluation.

Procedure

The OSLQ was administered online to a small sample of 45% (n= 48) participants who have engage with the course at least once after registration. Within these participants about 56% (n=27) were active in the course and have responded to the entry survey questions. 23% (n =11) responded to the OSLQ

for which most of the SRL dimensions results were based on. After the data was collected, some of the items were coded and adapted for our research benefits. The questions in the measuring instrument were modified to suit our research objectives. The participants were assured their responses will be anonymous and in confident. The data were imported from eLDa platform into Microsoft Excel application and then imported to SPSS (v.22.0). The Excel data were converted to comma separated values (csv) file and imported to R-Studio where further analyses were performed in order to compare the results with the SPSS analysis.

Data analysis

Analysis was performed using Statistical analysis. Descriptive evaluation of the data was done using the Statistical Package for the Social Sciences (SPSS) tool. The tool was used to evaluate the learners' responses in order to investigate individual self-regulated learning strategies and also identify the level of self-regulated learning amongst the participants. This analysis helps to reveal areas of SRL dimensions that need improving. Analyses were performed with the average score of the SRL dimensions.

Results

The results indicate better high self-regulated learning skills among learners that chose the path of a self-directed learning as compared to those that followed instructor-led mode of study. Table 1 illustrate the results from our nonparametric test conducted on the OSLQ data as described in the section below.

Table 1. One-sample chi-square analysis of the OSLQ

S/N	Null Hypothesis	Test	Sig.	Decision
	Hypothesis Test Summary			
1	The categories of GSQ1 occur with equal probabilities.	One-Sample Chi-Square Test	.801	Retain the null hypothesis. (p > .05)
2	The categories of GSQ2 occur with equal probabilities.	One-Sample Chi-Square Test	.178	Retain the null hypothesis. (p > .05)
3	The categories of GSQ3 occur with equal probabilities.	One-Sample Chi-Square Test	.078	Retain the null hypothesis. (p > .05)
4	The categories of GSQ4 occur with equal probabilities.	One-Sample Chi-Square Test	.484	Retain the null hypothesis. (p > .05)
5	The categories of GSQ5 occur with equal probabilities.	One-Sample Chi-Square Test	.078	Retain the null hypothesis. (p > .05)
6	The categories of GSQ6 occur with equal probabilities.	One-Sample Chi-Square Test	.147	Retain the null hypothesis. (p > .05)
7	The categories of TSQ1 occur with equal probabilities.	One-Sample Chi-Square Test	.078	Retain the null hypothesis. (p >.05)
8	The categories of TSQ2 occur with equal probabilities.	One-Sample Chi-Square Test	.543	Retain the null hypothesis. (p > .05)
9	The categories of TSQ3 occur with equal probabilities.	One-Sample Chi-Square Test	.029	Reject the null hypothesis. (p < .05)
10	The categories of TSQ4 occur with equal probabilities.	One-Sample Chi-Square Test	.147	Retain the null hypothesis. (p > .05)
11	The categories of TMQ1 occur with equal probabilities.	One-Sample Chi-Square Test	.234	Retain the null hypothesis. (p > .05)
12	The categories of TMQ2 occur with equal probabilities.	One-Sample Chi-Square Test	.078	Retain the null hypothesis. (p > .05)
13	The categories of ESQ1 occur with equal probabilities.	One-Sample Chi-Square Test	.364	Retain the null hypothesis. (p > .05)
14	The categories of ESQ2 occur with equal probabilities.	One-Sample Chi-Square Test	.003	Reject the null hypothesis. (p < .05)
15	The categories of ESQ3 occur with equal probabilities.	One-Sample Chi-Square Test	.484	Retain the null hypothesis. (p > .05)
16	The categories of HSQ1 occur with equal probabilities.	One-Sample Chi-Square Test	.200	Retain the null hypothesis. (p > .05)
17	The categories of HSQ2 occur with equal probabilities.	One-Sample Chi-Square Test	.364	Retain the null hypothesis. (p > .05)
18	The categories of SEQ1 occur with equal probabilities.	One-Sample Chi-Square Test	.020	Reject the null hypothesis. (p < .05)
19	The categories of SEQ2 occur with equal probabilities.	One-Sample Chi-Square Test	.078	Retain the null hypothesis. (p > .05)

Asymptotic significances are displayed. The significance level is .05.

Nonparametric Test

Nonparametric statistics referred to statistical method where the data is not required to fit into a normal distribution. The test is conducted on ordinal data which does not depend on numbers but order of sorts for which the data appears, unlike other statistical analysis, nonparametric statistics is not based on assumption about the probability distributions of the variables to be assessed Shah and Madden (2004). The procedure does not depend on any underlying random variables with a special form such as in Gaussian, it is said to be distribution free (Hollander et al., 2013; Savage, 1957; Siegel and Castellan, 1988). The nonparametric test was conducted on the 19-item of the OSLQ. To test for statistical significance, we set up a null hypothesis that 'the categories of each individual item occur with equal probabilities'. We then test with one-sample chi-square test. Our results indicated that majority of the individual categories approximately 85% (n = 16) items retain the null hypothesis, while 16% (n =3) items reject the null hypothesis in the significant level of 0.05 as seen in Table 1.

Visualisation of learning preferences

Figure 2 shows profiles of learners' preferred mode of learning including: interactive learning, collaborative learning, instructor-led learning and self-directed learning respectively. Using the frequency of respondents' preferences from the survey questions, the learning profiles were created. The question that in-formed the knowledge of these preferences is thus: 'what kind of online course delivery do you prefer?' The learners can choose more than one option. The Figure 2 presents some interesting results which suggest areas of further exploration. The profile of learners preferring interacting learning reveals over 35%, the second highest preference though very close call was the self-directed learning, which shows approximately 31%. The last two were instructor-led learning with 19% and collaborative learning preferences have the least with 15%. This was calculated based on the number of responses received. This analysis demonstrates the level of course engagement and preference for which effective participation could be sort. The interactive learning could be inform of discussion forums, social media, private messages, quizzes, practical exercises and feedback surveys. Most of these features were incorporated in the eLDa platform using compatible Wordpress plugins to support and motivate learning. The learners also appears to self-direct their learning process, which correspond to the result from the SRL results section.
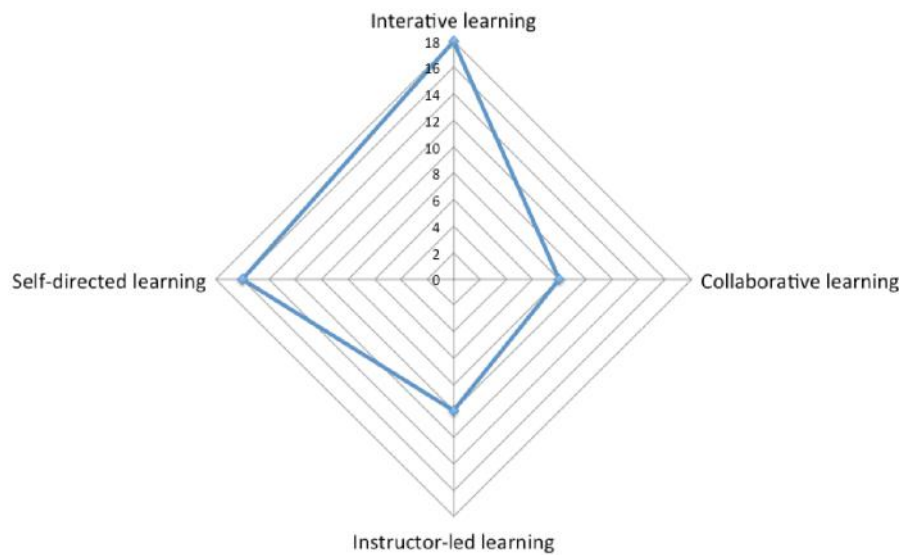
Figure 2: Learners preferred mode of learning

Categorising SRL dimensions into high and low self-regulators

We are categorising the average SRL dimensions of the learners from the two modes: self-directed and instructor-led modes. During the data collection process using the course entry survey, there were four options: (1) self-directed learning (2) instructor-led (3) Both modes and (4) undecided. In the survey response, three learners preferred the self-directed route of study, two learners preferred the instructor-led route, Three learners again preferred both self-directed mode and instructor-led mode of learning and finally two learners again undecided on which their response in respect to the route to follow during their choices of learning. In order for us to categorised the learners and to be able to obtain substantial data in the two main modes in this paper, we decided to group the modes into two major modes. We grouped the learners who preferred self-directed and both-self-directed and instructor-led modes of study into 'self-directed' category and learners who preferred instructor-led modes and those who are undecided into 'instructor-led' category. This classified was done in accordance to satisfying the requirement of one of our research questions.

- To what extent do learners choose to direct their own study path as opposed to following a guided course?

The results show that within the various dimensions of goal setting (GS), task strategies (TS), time management (TM), environment structuring (ES), help seeking (HS) and self-evaluation (SE). The level of self-regulators in these categories varies from learner to learner. The process we applied was to approximate the calculated averages of the categorised dimensions into single digit as seen in Table 2 and Table 3. The reasons for this is to be able to identify the level of competency, in order to help us identify high and low self-regulators.

In this study we decided to classify learners who score average below 3.50 to be low self-regulators and learners with score average 3.50 and above to be high self-regulators (this is do to our sample size and to help with the interpretation of the results better). For example the average score of the SRL dimensions for 'learner 2' shows high self-regulated learning ability in most of the dimensions but one. This indicates that learner 2 is a competent high self-regulator in all the dimensions and need to improve in help seeking ability as shown in Table 2. The implication of this shows that MOOC ability for a one-size-fit-all approach might not be fully suitable to all the learners using the idea of self-regulated learning habit. This learner choose to direct their learning, depending solely on their own ability and show low ability to interact or seek for help from other learners. Comparing this finding with other related studies shows that some learners in a MOOC pattern of learning will preferred to study alone by themselves. Following the Observation from the average column of the self-directed Learning (Table 2), the results indicate this the earlier point and we can categorise learners 2 and 7 to be high self-regulators as their average scores of the six dimensions were 3.50 and above. The results show learners 1, 3, 4, 5 and 6 to be low self-regulators.

Table 2: Shows high and low self-regulators in the self-directed mode using the average scores

	GS	TS	TM	ES	HS	SE	Average
Learner 1	3.33	2.75	2.50	3.00	2.00	4.00	**2.93**
Learner 2	4.67	3.75	5.00	5.00	2.00	4.50	**4.15**
Learner 3	3.00	3.25	3.00	3.67	2.00	4.50	**3.24**
Learner 4	3.33	3.50	3.00	3.33	2.00	5.00	**3.36**
Learner 5	3.50	2.50	4.00	4.00	2.00	4.00	**3.33**
Learner 6	3.00	2.25	3.50	3.33	1.00	3.00	**2.68**
Learner 7	3.67	3.00	3.50	4.00	3.50	4.00	**3.61**

Also observing the results from the instructor-led learning, indicate that there are no high self-regulators as all the learners score an average below 3.50 (as seen in Table 3). This results indicated that learner 8, 9, 10 and 11 are low self-regulators. The full curve is illustrated and represented graphically in Figure 3.

Table 3: Indicate high and low self-regulators Instructor-led mode using the average scores

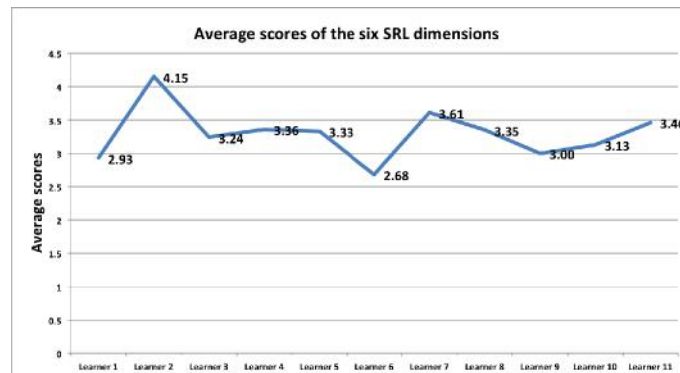|	GS	TS	TM	ES	HS	SE	Average
Learner 8	3.50	2.75	3.50	3.33	3.00	4.00	**3.35**
Learner 9	2.83	2.50	3.00	2.67	3.00	4.00	**3.00**
Learner 10	3.00	2.75	3.00	4.00	2.00	4.00	**3.13**
Learner 11	3.00	3.75	3.50	4.00	3.00	3.50	**3.46**

Figure 3: Overall average score of learners from the six dimensions

Figure 4 demonstrate the six SRL dimensions used in this study and the various modes and average scores obtained from each.

Figure 5 illustrates the direction of the responses received from the learners. The analysis shows no uniform direction and this correlate with our initial discussion about the unique identity brought into the platform by the individual learners in this study which showcase their individuality and also helped them taking control of their studies. The results shows discrepancy in the 19-items that made the OSLQ in order to obtain the learners' SRL skills.
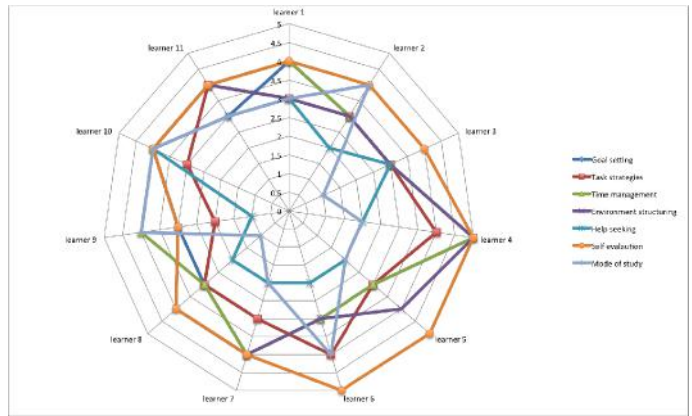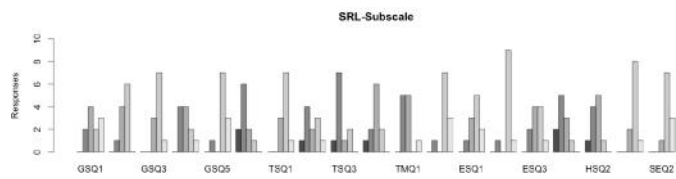
Figure 4: Learners average SRL dimension Levels

Figure 5: Responses from the OSLQ based on the dimensional categories

Discussion

Koohang and Paliszkiewicz (2013) argued that e-learning courses promote autonomous active learning activities constructed by the learners to enhance their knowledge. This study investigate learners taking the initiative to control their learning and also how the novel platform tool has supported the learners in making informed choices towards directing their learning paths. The tool was able to foster the SRL skills by way of making effective use of features to support the modes of learning. Self-directed opportunities were offered to learners as well as guided opportunities which were led by the instructor. The main purpose of the instructor-led approach is to introduce lesson prerequisites that will lead the learners to specific (navigation) link containing resources which are associated to their current lesson of study. Although the tool allows flexibility of learning paths, learners are not forced to comply with the prerequisites. They can at any time switch mode of study for which they felt is suitable to the course content they are engaging with at that moment. The two main routes of study is decided by themselves and they are free to change from one route to another with the support of the features introduced in the eLDa tool. Some studies shows that appreciating new features in learning tools could be seen from the perspectives of different learners, as not all learners welcome changes in their routine e-learning environment irrespective of the benefits (Mello, 2016; Entwistle and Peterson, 2004). The main objective of this study is to understand the SRL strategies in self-directed learning routes and the instructor-led routes. Also to mention that results were also emerging from learners who have decided to switch between both modes, thus they are refer to 'learners that preferred both modes' of learning. These new findings will be further explore in the future.

Conclusion

Although the results presented here are from a small population sample, it indicates SRL dimensions from the two main modes of learning in this study: self-directed modes and instructor-led modes. At the beginning of the course, the learners were given the options of two routes (self-directed and instructor-led) to follow in order to engage effectively with the course. When a learner opted for the self-directed routes, they study the resources as they preferred and at autonomy to move from one lesson content to another without following the prerequisites suggested (McManus, 2000). But if the learners opted for the instructor-led routes, they are guided in an instructional manner with support from the lesson prerequisites. The lesson prerequisites in this case motivate the learners to build personal SRL skills while been led to study in a linear way. Our results indicate two distinct representation of the individual profile of self-regulated learning from the analysed sample: high self-regulators and low self-regulators. The results reveal that the competent self-regulators as observed mostly within the self-directed learning and instructor-led mode show high level of self-regulated strategies in their responses with few strategies to improve. But for the low self-regulators, these learners need to improve in their self-regulated learning strategies, as most of their responses fell into the negative scales. The results also indicate the individuality of the SRL dimensions observed from the learners, which reveals the different paths that most of the learners wish to follow in their study.

In summary, we define success as not the level of completer, but the learners meeting their expectations. Some issues of low completion rates in MOOC might not be because the learners are not motivated to participate, but as some of the learners are engaging with the course at their own pace (Onah et al., 2014). In this new innovative learning platform (known as 'eLDa'), completion rate was measured in relation to the learners achieving their learning goals. Further investigation of these results will be done to explore new investigation with a blended module ran in the eLDa platform tool.

Acknowledgment

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