THE ASIA-PACIFIC SCHOLAR
MEDICAL AND HEALTH PROFESSIONS EDUCATION

ORIGINAL ARTICLE

Submitted: 3 June 2021
Accepted: 4 October 2021
Published online: 4 January, TAPS 2022, 7(1), 76-86
https://doi.org/10.29060/TAPS.2022-7-1/OA2547

Measuring online self-regulated learning among early-career medical doctors in a Massive Open Online Course on COVID-19

Nadia Greviana[1,2], Dewi Anggraeni Kusumoningrum[2], Ardi Findyartini[1,2], Chaina Hanum[1] & Garry Soloan[1,3]

[1]Medical Education Center, Indonesian Medical Education & Research Institute (IMERI) Faculty of Medicine Universitas Indonesia, Jakarta, Indonesia; [2]Department of Medical Education, Faculty of Medicine Universitas Indonesia, Jakarta, Indonesia; [3]Undergraduate Program in Medicine, Faculty of Medicine Universitas Indonesia, Jakarta, Indonesia

Abstract

Introduction: As significant autonomy is given in a Massive Open Online Course (MOOC), online self-regulated learning (SRL) ability is crucial in such courses. We aim to measure the online SRL abilities of early-career medical doctors enrolled in a MOOC.

Methods: We performed a cross-sectional study using the Self-Regulated Online Learning Questionnaire-revised version (SOL-Qr). We conducted a three-stage cross-cultural validation of the SOL-Qr, followed by Confirmatory Factor Analysis (CFA). The online SRL ability of 5,432 medical doctors enrolled in a MOOC was measured using the validated SOL-Qr.

Results: The CFA of the cross-translated SOL-Qr confirmed its comparability to the original version, with excellent validity & reliability. Participants showed high levels of online SRL during their early careers. Despite high online SRL scores, MOOC completion rate was low. Male participants showed slightly better time management ability than female participants. Participants working in the primary epicentrum for COVID-19 in the country showed lower online SRL scores, while participants who graduated from higher accreditation levels showed better time management ability.

Conclusion: The SOL-Qr and its subscales are suitable and valid for measuring the online SRL abilities of medical doctors in a MOOC during their early-career period. Time management ability was associated with previous experience during the medical education period, while other online SRL subscales were mostly associated with workload. However, as the scores did not correlate with the time spent for learning in MOOC, the corresponding learning effort or time spent may be beyond just the commitment to the described MOOC.

Keywords: *Self-Regulated Learning, MOOC, Online Learning*

Practice Highlights

- It is important to take into account learners' online SRL ability in MOOCs as it is dynamic across online learning contexts.
- The use of the SOL-Qr is beneficial for providing learners' online SRL profiles in MOOC during medical doctors' early career period.
- Understanding online SRL abilities helps MOOC developers to evaluate learning activities in MOOC and support learners' online SRL ability.

I. INTRODUCTION

Massive Open Online Courses (MOOCs) are open academic platforms in which students can access learning resources interactively. The self-paced nature of MOOCs provides time-flexibility, facilitating deeper learning (Bullock & De Jong, 2013). MOOCs are useful for replacing direct interaction for knowledge transfer and learning processes during the ongoing pandemic because they utilise various formats, such as video lectures, reading resources, assignments, tests, and

asynchronous discussion within the platform (Sandars & Patel, 2020). Because MOOC's aim to give learners useful resources and empower teachers to provide vital knowledge, curation of the platform, with its copious information, it is beneficial for achieving high-quality content that fits the learning objectives and learners' characteristics (Asarbakhsh & Sandars, 2013). As demand for technological solutions in education rise during the COVID-19 pandemic, MOOCs have been promoted as forms of disruption that accelerate adaptation to balance safety with the achievement of competencies by medical students and graduates (Hall et al., 2020; Liang et al., 2020).

MOOCs have generally been designed as open in access, location, pace, and time of completion; therefore, learners must control their learning process. Learning goals are usually set less strictly in MOOCs than in other courses. Unlike traditional, face-to-face teaching, MOOCs require highly engaged & strategic students. Learners must plan their study, set goals, evaluate their knowledge related to the course material, adapt their learning strategies, and assess their performance. They are solely responsible for managing their time and study environment (Jansen et al., 2017).

With high enrollment rates, the majority of learners fail to complete MOOCs, for various reasons: lack of time, insufficient prior knowledge, inadequate supervision, and difficulties in understanding the course materials (Hew & Cheung, 2014). Time management, effort regulation, metacognition, and critical thinking as part of Self-Regulated Learning (SRL) relate to success in online academic activities (Broadbent & Poon, 2015). Because MOOCs give students significant autonomy in completing the course, SRL is crucial for successful completion of MOOCs (Chung, 2015; Wong et al., 2018).

SRL encompasses a student's ability to actively and constructively control their thoughts, acts, and emotions towards learning objectives (Jouhari et al., 2015), using the cycle of forethought, performance, and self-reflection phases, which should be implemented in an online learning environment (Panadero, 2017). Various external factors may interplay and affect self-regulated learning among students. This underscores the importance of a supportive family, helpful peers, and motivational, feedback-centered instruction methods; together, these factors support SRL (Jouhari et al., 2015).

Virtanen and Nevgi (2010) recognised gender as a factor affecting how SRL is perceived by students, especially during the forethought stage; they found that male students scored slightly higher on the sub-scale for self-efficacy, while female students demonstrated greater help-seeking strategies, performance anxiety, and beliefs in the value of studying. Bembenutty (2009) also found that female students perceive learning as a more valuable task in SRL than male students do.

Several instruments were developed to measure SRL, including structured interviews like the Self-Regulation Interview Schedule (SRLIS), questionnaires, teachers' judgments, think-aloud techniques, and performance observations (Magno, 2011). The Motivated Strategies for Learning Questionnaire (MSLQ) is a common measure of SRL. It assesses two aspects: motivational orientation—encompassing values, expectations, and affective components—and the use of different learning strategies, e.g. cognitive and metacognitive strategies or resource management strategies (Pintrich et al., 1993). Another instrument for measuring students' SRL in higher education is the Academic Self-Regulated Learning Scale (A-SRL-S), evaluating memory strategy, goal-setting, self-evaluation, seeking assistance, environmental structuring, learning responsibility, and planning and organising (Magno, 2011).

In the context of online learning, several instruments have been developed to measure students' SRL, such as the Online Self-regulated Learning Questionnaire (OSLQ) and the Self-regulated Online Learning Questionnaire (SOL-Q). The OSLQ consists of six subscales: environment structuring, goal-setting, time management, help-seeking, task strategies, and self-evaluation (Barnard et al., 2009). However, this questionnaire cannot measure SRL activities in the appraisal or self-reflection phase. Meanwhile, the SOL-Q was developed by Jansen et al. (2017), using other existing SRL questionnaires to measure SRL activities, specifically in MOOCs, for all three SRL phases: preparatory, performance, and appraisal. The SOL-Q consists of five sub-scales: metacognitive skills, environmental structuring, help-seeking, time management, and persistence (Jansen et al., 2017). In 2018, a revision was made to split the metacognitive skills scale into three subscales: metacognitive activities before, during, and after a learning task. The revised questionnaire (SOL-Qr) demonstrated improved validity, usability, and reliability (Jansen et al., 2018).

Recognising the importance of learners' during the use of MOOCs—and that SRL is affected by various factors—we attempted to measure the online self-regulated learning of early-career medical doctors enrolled in a MOOC that provides essential knowledge about COVID-19 to support medical doctors' early careers during the COVID-19 pandemic. We seek to answer the following questions in this study:

1. Is the Self-Regulated Online Learning Question (SOL-Qr) valid for use in our setting?

2. What is the profile of students' SRL scores, and are there any relationships between the SRL score, course completion, gender, respondents' former medical school, and internship location?

II. METHODS

A. Context

With approximately 270 million inhabitants across 34 provinces, Indonesia is one of the largest archipelagos in the world. According to a recent report, there is one medical doctor per 2500 people across the country (National Ministry of Health, 2020). Recently graduated medical doctors must undergo a one-year compulsory internship program upon graduation, where they serve as front-liners in primary health care settings across the country to serve in societies in very diverse sociocultural contexts and ethnicities. Those who graduated in 2020, mostly finished high school and entered medical schools in 2013–2014, completed their clinical stages and graduated from different medical schools in Indonesia at the beginning of the COVID-19 pandemic, during which some of the clinical duties in teaching hospitals were suspended and amended for safety reasons (Findyartini et al., 2020). A total of 93 public and private medical schools are distributed across Indonesia, all accredited by the National Accreditation Agency for Higher Education in Health with A-level as the highest accreditation indicating that the medical school has reached an established quality in teaching-learning processes and faculty members.

Considering the need for the newly graduated medical doctors serving as front liners to learn about the current pandemic situation and the importance of safety for both patients and healthcare workers, the Ministry of Health equipped these new graduates with essential COVID-19 knowledge before their involvement in patient management during the ongoing pandemic. Given the geographical reality of the country's archipelago and the nature of the workplace setting during the internship program, the use of a Massive Open Online Course (MOOC) was preferred.

Little was known about COVID-19 at the beginning of the pandemic. Guidelines created by organisations (such as the CDC and WHO) are mostly amended living documents based on newly published articles, data, and clinical expertise. Studies on COVID-19 are being conducted on a massive scale worldwide, which may create information overload and overwhelm learners, especially those serving as front-liners (Poonia & Rajasekaran, 2020). A MOOC approach would facilitate a prompt response for equipping medical and health students, professionals, and the broader community to learn about the pandemic situation and prepare them to contribute to the pandemic response in community and hospital settings (Ortiz-Martìnez et al., 2021).

B. The COVID-19 MOOC Description

All internship doctors in Indonesia batch 3 and 4 in 2020, were compulsorily enrolled in an open course on COVID-19 at the beginning of their internship period. The open course was sequenced into two, sequentially accessed parts. The mandatory part A consists of fundamental knowledge on COVID-19 (such as COVID-19 screening, triage, infection control, management of patients, preventive strategy, etc); Part B consists of supplemental knowledge about COVID-19 (such as management of patients with comorbidity, ethics, and medicolegal aspects, perioperative management, etc); it is optional for participants to choose which topics to learn based on their interests and needs. Participants were encouraged to complete Part A during the first two weeks of their internship program to ensure sufficient knowledge before their service. However, participants were given full access to revisit the MOOC for up to 9–12 months of their internship programs. More details on the online course are reported elsewhere (Findyartini et al., 2021).

C. Study Design and Instruments

Our cross-sectional study uses the SOL-Qr (Jansen et al., 2018), which was adapted to Bahasa Indonesia, to assess online self-regulated learning ability in a Massive Open Online Course. Secondary data were obtained from the Moodle-based MOOC platform, including the total number of respondents, gender, internship location, former medical school, and course completion.

SOL-Qr measures seven aspects of SRL as mentioned in Table 1. Respondents answer each item on a 7-point Likert scale (1 for "not at all true for me" and 7 for "very true for me"). This questionnaire was translated to Bahasa Indonesia and back-translated to English to ensure similarity in meaning. Cognitive interviews with four respondents resembling the study participants were also conducted to obtain clarity of the items. The two respondents in this phase were final year medical school students from the authors' institution (prospective participants of the national internship program) and the other two respondents were medical doctors who have just completed the national internship program.

No	Aspects of SRL	Descriptions	Numbers of items
1.	Metacognitive skills before learning	measuring strategic planning ability in the preparatory phase	7
2.	Metacognitive skills during learning	measuring metacognitive ability during learning phase	7
3.	Metacognitive skills after learning	measuring reflective ability on learning progress and learning strategies	6
4.	Time management	measuring strategy on time management during learning	5
5.	Environmental structuring	measuring strategy on environment management during learning	4
6.	Persistence	measuring motivation control dan effort regulation during learning	7
7.	Help-seeking	measuring help-seeking behavior during learning	6

Table 1. Descriptions of SOL-Qr (Jansen et al., 2018)

Course completion, as analysed in this study, refers to the completion rate (in percentage) of the optional topics in part B that were accessed and completed by study participants in the open course.

D. Data Collection

Data were collected from the Moodle-based MOOC platform of the COVID-19 module from January to February 2021, two months after each course had started. This study uses a total sampling approach, with a minimum sample size of 204 respondents, calculated from standard deviation of 3.43 (Yen et al., 2016) and alpha (type I error) of 0.05 and beta (type II error) of 0.20 and 10% estimated drop out level.

All study participants were National Internship Medical Doctors in the year 2020 who were enrolled in the COVID-19 Open Course on the MOOC platform.

The SOL-Qr questionnaire was embedded in the evaluation questionnaire placed at the end of Part A, before participants moved forward to Part B. The questionnaire was completed voluntarily by participants who agreed to participate in this study. They were given adequate written information about the study and assured that there were no consequences of participation in regards to the course or the internship program evaluation. All data included in this study were collected from participants who signed and agreed upon the written consent embedded in the questionnaire. This study obtained ethical clearance from Faculty of Medicine Universitas Indonesia/ dr. Cipto Mangunkusumo General Hospital Research Ethics Committee Board (KET-1395/UN2.F1/ETIK/PPM.00.02/2020) in 2020.

E. Data Analysis

We conducted a three-stage validation process for the SOL-Qr, including the process of translation to Bahasa Indonesia by the research investigator, the back-translation process, and a review process by four newly graduated medical doctors who represented the characteristics of the study participants. This process ensured that the Bahasa Indonesia version of SOL-Qr was comparable to the original version. Furthermore, a Confirmatory Factor Analysis (CFA) was performed to confirm the model proposed by Jansen et al. (2018) as a fit model in the Bahasa Indonesia version compared to the original version. The fit model of CFA analysis determined whether normality, multicollinearity, residual values, and multivariate outliers were met. Furthermore, the Two-Index Presentation Strategy, the fit index combination of at least two indicators among the root mean square error of approximation (RMSEA), the standardised root mean square residual (SRMR), and the comparative fit index (CFI) all indicated the fit model of CFA analysis (Hu & Bentler, 1999; Schreiber et al., 2006). Internal consistency analysis of the Bahasa Indonesia version of SOL-Qr was also completed. Items were concluded as valid if the corrected item-total item correlation value was higher than 0.3. The questionnaire was considered reliable if alpha Cronbach $\geq$ 0.700; an alpha value higher than 0.900 indicates excellent internal consistency (Blunch, 2008).

All survey data obtained from the questionnaire were statistically analysed using IBM SPSS Statistic version 21. Demographic data were processed using descriptive statistics (proportion, mean, and standard deviation). Study participants were classified into two groups according to their internship location:

- Medical doctors who serve in Java- Bali Region, which was the primary epicenter of COVID-19 in the country in 2020.
- Medical doctors who serve in Outside Java- Bali Region.

We also classified participants according to their former medical school accreditation.

Bivariate analysis using the t-independent test was used to find relationships between the online self-regulated learning scores and gender, internship location, the former medical school, and the course completion. The Pearson correlation test was also used to analyse

correlations between online SRL subscales and the course completion rate.

III. RESULTS

A. Validation of the SOL-Qr

The three stages of validation were conducted in the SOL-Qr instrument to ensure the content validity of the Bahasa Indonesia version of SOL-Qr. CFA was performed on the Bahasa Indonesia version of SOL-Qr, with the results showing the goodness-of-fit according to Hu and Bentler's Two Index Presentation; the SRMR value was 0.056 (<0.08) while RMSEA value was 0.078 (<0.08). Meanwhile, the $\chi 2/df$ value was < 0.001; the CFI value was 0.874 (Hu & Bentler, 1999). The model (Figure 1) also confirms the comparability of the subscales to the original SOL-Qr.

The Bahasa Indonesia version of SOL-Qr also shows excellent validity and reliability, with a Cronbach's alpha of 0.974. The reliability of each subscale ranges from 0.971 to 0.975.

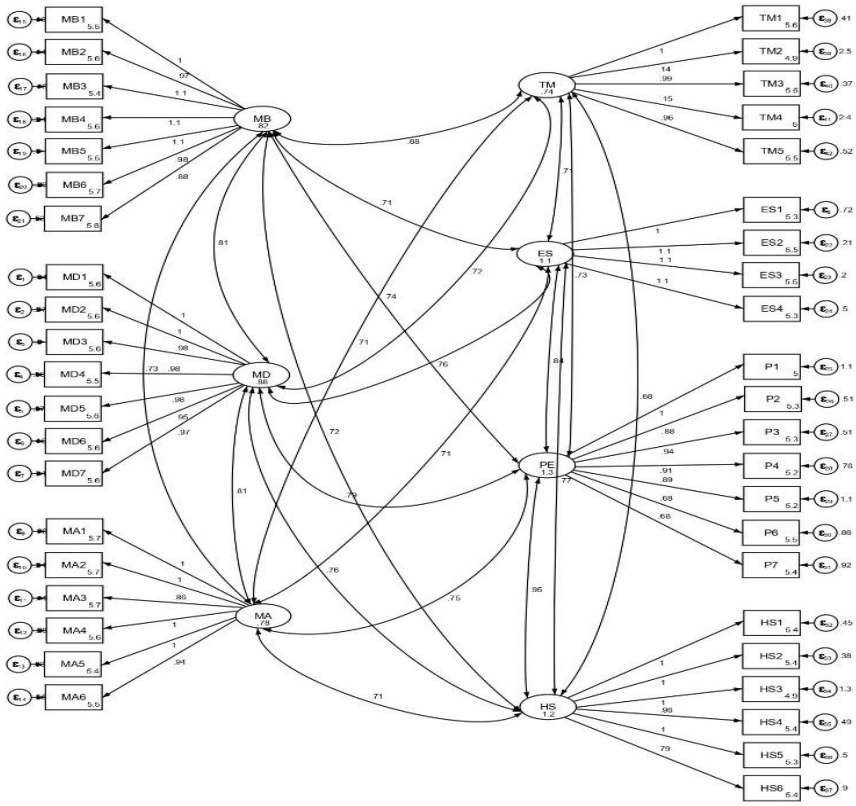

Figure 1. CFA results of the National Language Version of SOL-Qr (MB: Metacognitive Before, MD: Metacognitive During, MA: Metacognitive After, TM: Time Management, ES: Environmental Structuring, P: Persistence, and HS: Help Seeking)

B. Profile of Participants' Online SRL Scores

A total of 5,846 internship doctors from all 34 provinces in Indonesia were enrolled and accessed the MOOC; as many as 5,432 participants, graduated from 74 medical schools (of which 46% are A-accredited while 54% are B-accredited), agreed to participate in the study (response rate of 92.9%). Details on the study participants are presented in Table 2.

Gender	Internship Location		Former Medical School		
	Java-Bali Region n (%)	Outside Java-Bali Region n (%)	A-accredited n (%)	B-accredited n (%)	Total n (%)
Male	904 (32.3)	783 (29.7)	1038 (31.1)	649 (31.0)	1687 (31.1)
Female	1896 (67.7)	1849 (70.3)	2300 (68.9)	1445 (69.0)	3745 (68.9)
Total	2800 (100)	2632 (100)	3338 (100)	2094 (100)	5432 (100)

Table 2. Study participants (N = 5,432)

C. Relationship Between Online SRL Score, Course Completion, Gender, and Internship Location

Data on the online SRL scores and course completion were analysed according to gender, internship location, and medical school accreditation. The data are described in means and standard deviations, as they were normally distributed, as shown in Table 3.

	Metacognitive skills before		Metacognitive skill during		Metacognitive skills after		Time management		Environmental structuring		Persistence		Help-seeking		Total SRL score		Course completion	
	Mean ± SD	P-value	Mean ± SD	P-value	Mean ± SD	P-value	Mean ± SD	P-value	Mean ± SD	P-value	Mean ± SD	P-value	Mean ± SD	P-value	Mean ± SD	P-value	Mean ± SD	P-value
Gender																		
Male	38.88 ± 6.78	0.808	38.95 ± 6.92	0.626	33.59 ± 5.59	0.866	26.86 ± 4.27	**0.001**	21.67 ± 4.61	0.540	36.78 ± 7.43	0.636	31.69 ± 7.04	0.269	228.42 ± 35.34	0.785	36.91 ± 45,34	0.445
Female	38.84 ± 6.45		38.86 ± 6.52		33.61 ± 5.36		26.46 ± 4.02		21.59 ± 4.47		36.88 ± 7.13		31.91 ± 6.52		228.15 ± 33.43		37.93 ± 45,42	
Internship location																		
Java-Bali Region	33.48 ± 6.53	**P < 0.001**	38.51 ± 6.68	**P < 0.001**	33.25 ± 5.43	**P < 0.001**	26.44 ± 4.03	**0.001**	21.46 ± 4.50	**0.010**	36.72 ± 7.05	0.181	31.46 ± 6.74	**P < 0.001**	226.33 ± 33.93	**P < 0.001**	38.07 ± 45,52	0.444
Outside Java-Bali Region	39.25 ± 6.56		39.29 ± 6.59		33.98 ± 5.40		26.73 ± 4.18		21.78 ± 4.52		36.98 ± 7.40		32.25 ± 6.60		230.26 ± 34.03		37.13 ± 45,26	
Former medical school																		
A-level accredited	38.74 ± 8.43	0.098	38.76 ± 6.54	0.075	33.49 ± 5.35	0.056	26.70 ± 4.07	**0.009**	21.61 ± 4.44	0.966	36.82 ± 7.07	0.732	31.83 ± 6.51	0.827	227.95 ± 33.55	0.435	37.92 ± 45,35	0.536
B-level accredited	39.04 ± 6.75		39.09 ± 6.81		33.78 ± 5.55		26.40 ± 4.16		21.62 ± 4.63		36.89 ± 7.46		31.87 ± 6.96		228.69 ± 34.78		37.13 ± 45,47	

Table 3. Profile of online SRL and course completion according to gender, internship location, and medical school

According to Table 3, the average total scores of participants' online self-regulated learning in all groups show high levels of online SRL (SRL score > 5). When comparing the male and female participants, the finding suggests that only the Time Management subscale shows a significant difference ($p = 0.001$). Male participants show higher scores in time management than female participants. Participants from the Outside Java-Bali Region had significantly higher online SRL scores in all subscales, except for the Persistence subscale ($p = 0.181$), than participants from the Java-Bali Region, which was the primary epicenter of COVID-19 in the country.

Meanwhile, the online SRL scores of participants who graduated from A-level versus B-level accredited medical schools mostly show similar online self-regulated learning scores, except in the time management scale ($p = 0.009$).

Although Table 3 shows no significant difference regarding course completion across gender, internship region, or former internship location, it does show a low course completion rate. Participants only completed less than approximately 40% of all optional topics in Part B.

The results of the Pearson correlation test show significant differences between the course completion rate and several SRL subscales, with very low correlation values ($r < 0.1$ in all subscales) for the SOL-Qr in the whole samples, as well as between the internship location and former medical education groups. Only the Time Management score was correlated to Course Completion in the Outside Java-Bali group, with a very low correlation value ($r = 0.102$). Therefore, the course completion rate does not correlate with the online SRL scores.

IV. DISCUSSION

Self-regulated learning is a dynamic process and may change while learners undergo various learning contexts (Barnard et al., 2009). The rapidly changing pandemic has accelerated the adaptation of new learning approaches and methods worldwide, including MOOCs that had gained popularity. Therefore, the use of the SOL-Qr is beneficial for providing MOOC learners' SRL profiles (Jansen et al., 2018).

This study represents the first successful attempt to cross-culturally validate the SOL-Qr and determine the suitability of all its subscales for profiling online SRL of medical doctors in their early career. The three-stage validation process for the SOL-Qr was conducted as a form of cross-cultural adaptation of the instrument to facilitate its use in measuring self-regulated learning abilities in an online setting in the context of medical education—specifically in the MOOC used for continuing medical education and professional development programs for early-career, newly graduated medical doctors (Hambleton, 2005). The CFA conducted in this study also demonstrates a good fit, with excellent internal consistencies of the SOL-Qr and its subscales; this demonstrates the comparability of the instrument with the original SOL-Qr (Jansen et al., 2018).

The use of the SOL-Qr in this study demonstrates online SRL abilities during the transition phase in the early careers of medical doctors, from medical students to medical interns. This study demonstrates the high average level of online SRL ability among newly graduated medical doctors (SRL score > 5). Participants' online SRL may increase due to the positive online learning experience obtained, considering that the knowledge on COVID-19 provided in this particular MOOC was vital and timely knowledge for these recent graduates. While participant perceptions of MOOCs have been reported elsewhere, it is known that positive perceptions of an online learning experience and environments are significantly correlated with the online SRL score (Abouzeid et al., 2021; Findyartini et al., 2020; Liaw & Huang, 2013).

The high scores for online SRL in our study were found in total and in most of the subscales, except for the metacognitive skills before learning (MB) scale in participants from the Java-Bali region. A similar finding on the low level of metacognitive ability was reported during the transition phase from preclinical to clinical learning, which was associated with previous clinical experience (Cho et al., 2017). Albeit being assessed using a different instrument, the decreased level of metacognitive skill in this study may also be affected by a similar factor. Since the Java-Bali Region had been the primary epicenter of COVID-19 in the country, with the greatest number of COVID-19 cases (69.41%) out of all other regions (National Ministry of Health, 2021), most interns in the Java-Bali Region may have experienced being removed from their duties at the beginning of the pandemic for safety reasons during their last clinical rotations as medical students (Findyartini et al., 2020). This may have caused discomfort because they felt useless and unable to contribute to patient care, further affecting their sense of competence and motivation, despite previous clinical experiences. Hence, this may have affected the process of goal-setting and reflecting on their prior knowledge during the transition to becoming medical interns (Dornan et al., 2014; Dubé et al., 2015).

Findings of this study demonstrate no significant correlation between online SRL and the number of optional topics achieved by participants. This result was supported by the fact that, despite the high level of online SRL ability depicted in this study, the duration of which participants accessed the compulsory Part A was lower than the expected minimum duration as estimated by course developers although we did not explore whether participants learned about COVID-19 from any other learning resources (Findyartini et al., 2021). The current study also supports the results of a previous study with similar findings regarding online SRL scores and academic achievement, although this study does report a significant relationship between online discussion and academic achievement (Abouzeid et al., 2021). The MOOC examined in this study does not provide two-way interactions among learners or between learners and instructors, which may affect the low number of optional courses completed.

Our study also shows that the online SRL scores of participants in the Outside Java-Bali Region were significantly higher ($p < 0.001$) across all scales than those of participants in the Java-Bali Region, except on the Persistence scale ($p = 0.181$). This suggests that participants in the Outside Java-Bali Region also have better time management, environmental structuring, and help-seeking abilities, which may relate to the workload at the internship locations. Participants in the Java-Bali Region face a higher workload and stress as front-liners in managing patients during the COVID-19 pandemic (as health educators, contact tracers, vaccinators, etc.). This aligns with other findings suggesting that an optimal workload determines the quality of students' SRL in the early transition and adaptation phases (Barbosa et al., 2018).

Furthermore, the MOOC was given to the participants at the beginning of their internship programs, in which several orientations and patient management also took place. Hence, it is confirmed that the participants' workload affected the time allocated to learn the MOOC (Eriksson et al., 2017). This study also suggests that the use of the MOOC for knowledge provision would preferably occur with sufficient time before immersion in other workplace-based learning experiences.

Hew and Cheung (2014) report few challenges in MOOC completion, including a lack of time and having other priorities to fulfill the course; therefore, time management ability remains crucial. The results of this study indicate that male participants had slightly better time management abilities than female participants. Although the absolute difference of the scores between groups is small, this study involved 5,432 respondents (much more than the minimum sample size), thus small differences in results can be statistically significant. As newly graduated doctors, study participants were interns who worked in a new environment hence new challenges regarding workplace relationships and workload may be faced. Previous studies show that female and male physicians may perceive these challenges differently (Babaria et al., 2009). Female physicians report that they feel uncertain and stressed when facing different clinical environments. Because they tend to need more time to adapt than male physicians (Malau-Aduli et al., 2020), completing a MOOC may not be their priority. Moreover, with masculinity/femininity level of cultural determinant, Indonesians have a clear cut between gender roles, thus affecting roles of female participants in most settings (Mangundjaya, 2013). Female participants may culturally face different roles in their personal lives, such as the expectation to perform housework and childcare, in addition to their internship obligation resulting in conflicting time and higher stress levels. The conflicting time and higher stress level in both work and personal life (Isaac et al., 2013) may influence female participants' ability to commit time to learn and work and may explain the lower time management scores among female participants.

This study also highlights that, overall, the online SRL scores of participants graduating from the A-level and B-level of accredited medical schools show similar results, except on the time management scale ($p = 0.009$), where the participants from the higher level accredited schools show higher scores than the participants from the lower level accredited schools. Prior online learning experience has been reported as an important determinant of online learning success (Vilkova, 2019). For newly graduated doctors completing an internship program, prior online learning experience may be largely attributed to the use of online learning formally in their medical school's curriculum. Our study suggests that the higher accredited medical schools may provide more online learning experiences, leading to better time management skills among the participants from this group. Furthermore, MOOC completion and the fulfillment of learning outcomes were determined by the forethought phase in the students' SRL; thus, the goal-setting, self-efficacy, and task values should be emphasised by the participants and facilitated by the MOOC (Vilkova, 2019). Our study further indicates that time management in the use of the MOOC should be considered by learners in the forethought, performance, and self-reflection phases of their SRL; the planning stage of the MOOC development must determine the estimated completion time for the whole course and its sections about the course learning outcomes and the participant's characteristics (Stracke et al., 2018).

Similar to the SRL ability in offline learning, our findings further imply the importance of accounting for learners' online SRL abilities, which are dynamic across online learning contexts, including MOOCs. Certain characteristics of MOOCs, such as their open access and self-paced nature, stress the importance of online SRL ability, especially for MOOCs used in the transition phase in the early career of medicine. Therefore, using validated and reliable instruments, such as the SOL-Qr, to measure the online SRL abilities of MOOC participants would help course developers to identify whether the online learning context supports or hinders learners' SRL abilities, thus helping course administrators further improve MOOC to provide further support for learners' SRL (Barnard et al., 2009; Sandars & Patel, 2020).

V. LIMITATIONS OF THE STUDY

We identify several limitations of this study. As this study examined online SRL ability of participants using a self-reported questionnaire, it was unable to examine the actual online SRL ability, given the poor correlation with the course completion rate. Furthermore, as the evaluation of online SRL was only conducted once, it was not possible to observe changes in SRL ability throughout the use of the MOOC or in a longer period. With the data that we obtained, we were also unable to analyse whether participants used other online resources to learn about COVID-19 before the internship program or parallel with accessing the provided module as the marker of online SRL nor to explain any causal relationships between online SRL scores and the factors under investigation. However, measurement of online SRL ability using the cross-culturally validated SOL-Qr reveals that this instrument can be used for MOOCs on continuing medical education and professional development in the early-career context.

VI. CONCLUSION

Our study demonstrates the cross-cultural validity of the SOL-Qr and the suitability of its subscales for use in the medical and health fields. The results portray the online SRL ability of medical doctors as participants in a MOOC during the transition phase in their early career. We found that the time management ability was associated with previous experience during the medical education period, while other subscales were mostly associated with workload during the transition phase. However, as the scores did not correlate with the completion rate of MOOC, it can be concluded that the questionnaire is a possible valid tool to assess self-regulated learning in the MOOC environment. Yet, the corresponding learning effort or completion rate may be beyond just the commitment to the described MOOC.

Notes on Contributors

NG designed and led the study, led data collection and analysis, and led manuscript development. AF, DAK, and CH contributed in data collection, completed data analysis, and contributed to manuscript development. GS contributed in the data analysis and manuscript development. All authors approved the final version of the manuscript.

Ethical Approval

This study obtained ethical clearance from Research Ethics Committee of Faculty of Medicine Universitas Indonesia/ dr. Cipto Mangunkusumo General Hospital (KET-1395/UN2.F1/ETIK/PPM.00.02/2020) in 2020.

Data Availability

Data will be available upon request to corresponding author due to conditions of consent provided by respondents in this study and that it should abide data sharing policy from the authors' institution and the Republic of Indonesia Ministry of Health.

Acknowledgement

The authors would like to acknowledge the Ministry of Health Republic of Indonesia for the trust that has been given to develop and organise the MOOC for the national internship program participants. We would also like to thank all national internship program participants for participation in this study and to Vernonia Yora Saki for assisting the authors with statistical analysis of the study. The preliminary results of this study were presented in Niigata Meeting 2020.

Funding

The development of MOOC and data analysis has been supported by the Ministry of Health Republic of Indonesia through a direct appointment decree to our institution.

Declaration of Interest

All authors state no possible conflicts of interest, including financial, consultant, institutional, and other relationships that might lead to bias or a conflict of interest.

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*Nadia Greviana
Faculty of Medicine Universitas Indonesia,
Jalan Salemba 6 Central Jakarta, Indonesia
Email: nadiagreviana@ui.ac.id/ nadia.greviana@gmail.com