DOI: 10.20535/2410-8286.249703

ASSESSMENT OF REFLECTIVE LEARNING STRATEGIES IN PEDIATRIC SURGERY COURSE AT MEDICAL UNIVERSITY

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The article is aimed at studying medical students' reflective strategies for learning the Pediatric Surgery course at medical university. We used a modified version of the Motivated Strategies for Learning questionnaire (Soemantri et al., 2018) which has four subscales: self-orientation, critical thinking, self-regulation, and feedback seeking. The self-orientation component deals with students' perceptions on their self-efficacy and internal motivation. The participants were fourty-six 5-th year medical students from the Bogomolets National Medical University, Kyiv, Ukraine. The survey was held in May 2021 when the students finished their spring semester in the online mode. We observed the prevalence of high and moderate levels in all the variables, but the indicators of Feedback seeking are lower which can be explained by the specificities of online learning. The authors propose methodological recommendations for educators how to create an environment for reflective learning to develop students' reflective skills and employ alternative assessment strategies in the classroom.

Keywords: reflective learning; online learning; pediatric surgery; medical university; self-efficacy; motivation; critical thinking; self-regulation; feedback seeking; self-assessment; peer-assessment.

Introduction

The COVID pandemic has brought many changes in teaching and learning process in Ukraine. Universities had to adapt quickly to new conditions and organise online education according to the curriculum. Online medical education faced many challenges, caused by social restrictions and impossibility or face-to-face communication between teachers, students and patients in hospitals. In these new conditions it is extremely important not only provide quality education, but also to measure students' reflection on their learning as the sufficient level of their formation influences students' success in acquiring necessary professional skills and competencies.

Current educational environment has affected the development of competencies (social, professional, individual), suggesting more opportunities for mastering the special competence while completing online courses, interacting with teachers via videoconferencing tools and upgrading theoretical knowledge. The analysis of recent articles on emerging online learning has shown that lack of social interaction is one of the strongest drawbacks indicated by students and teachers (Chornyi and Vakulych, 2020; Lukianenko and Vadaska, 2020; Mukan and Lavrysh, 2020; Saienko et al., 2020; Levitskyi et al., 2021). Students received mostly the reflective feedback from teachers, but there was a limited possibility to get the feedback from peers in the online mode. Still, collaborative work and peer assessment in remote learning is a challenge for many educators due to limited real-time communication (Yang, Mak, and Yuan, 2021). The majority of students consider that even perfectly organised online learning system cannot replace clinical practices, and they have missed many educational experiences (Salari and Sepahi, 2021). Thus, this is a challenging task for educators and university managers to organise education in the pandemic times using online interactive tools which will satisfy all educational and professional needs, including the development of social competence (teamwork, constructive feedback from peers and teachers, confidence in social interaction).

Literature review

In professional education and experiential learning, reflection is an important issue, which presupposes the act of thinking about what and how one has learnt it, including associated behaviour, ideas and feelings (Boud et al. 1985). Reflection is a multi-faceted activity in which content knowledge is combined with metacognitive and motivational processes to regulate the learning process (Soemantri et al., 2018). According to the researchers (Aronson et al., 2011; Mann et al., 2007; Sandars, 2009), reflection is critical in medical education as it allows students to be creative in clinical cases and social situations, to participate collaboratively in teams, to act professionally in stressful work environments, and to have enough motivation and skills to continuously improve their performance.

Self-orientation deals with students' perceptions on their self-efficacy and internal motivation (Soemantri et al., 2018). Current studies (Honicke and Broadbent, 2016; Yokoyama, 2019) have proved the strong correlation between self-efficacy and academic performance. In particular, Yokoyama (2019) concludes that specificities of online learning environment may affect connections between these two constructs. The researcher points out that proficiency in using online learning devices influences learning results. That is why teachers need to choose the online learning software they believe will have the most valuable content and/or tasks for students.

Critical thinking can be defined as the ability to identify and analyse problems as well as seek and evaluate relevant information in order to reach an appropriate conclusion (Zayapragassarazan, 2016). Cognitive skills such as evaluation, problem-solving, reflective thinking, logical reasoning, and probability thinking are considered to be the components of critical thinking skills in academic settings (Halpern, 1996). In the 21st century, metacognition and self-regulatory skills have have been studied in correlation with critical thinking, in addition to the cognitive skills recognised by earlier scholars (Paul and Elder, 2019; Park et al., 2021). Critical thinking is one of the core competencies in medical education according to the Institute for International Medical Education (Global minimum essential requirements in medical education, 2002).

To ensure the high standards in providing patient care, medical doctors have to define their own learning needs, set personal goals and engage in the most appropriate learning activities, i.e. to acquire self-regulation skills which means being proactive in learning process in terms of metacognition, behavior, motivation (Zimmerman, 1986; Jonker et al., 2010). Ertmer and Newby (1996) define self-regulated learners as individuals who are able to plan their study behavior, monitor their progress, reflect upon, and evaluate the entire learning process. Self-regulated learning is crucial in medical education (van Houten-Schat et al., 2018; Cho et al., 2017). It is viewed as a proactive learning process that is used to set learning goals and develop effective strategies for learning (Zimmerman, 2008). It has also been shown that self-regulated learning is one of the best predictors of academic performance (Lucieer et al., 2015; Agustiani et al., 2016; Palos et al., 2019).

To become a self-regulated and reflective learner, it is important to acquire effective learning skills and appropriate and timely feedback (Zimmerman 1986). Constructive feedback helps students reflect on their limitations and improve learning outcomes. Peer evaluation in collaborative learning can provide valuable feedback to medical students, and increase student confidence and quality of work as well as may contribute to the development of professional competence (Lerchenfeldt et al., 2019). The current research on online assessment (Hodge and Chenelle, 2018) indicates the necessity of providing students "opportunities to receive and engage with feedback formatively, when instructors set clear expectations about feedback timelines, and when instructors take advantage of the variety of feedback mechanisms online environments can provide, including peer and instructor feedback, as well as self-reflection." We support the idea of implementing online interactive tools for formative and summative peer assessment which will foster learners' self-reflection.

Thus, the **aim** of this paper is to study medical students' reflective strategies for learning the Pediatric Surgery course in the online mode. The tasks are the following:

1) to define and measure the levels of formation (high, moderate, low) of such variables as self-orientation, feedback seeking, critical thinking, self-regulation using the modified version of the Motivated Strategies for Learning questionnaire (Soemantri, Mccoll and Dodds, 2018) in correlation with students' final course grades.

2) to give recommendations to educators on how to create an environment of reflective learning in medical university.

Method

Research design

The present study is based on qualitative research design framework (Creswell, 2009) that was used to measure medical students' reflection on their learning using the closed-ended 34-item Likert scale questionnaire, together with the analysis of final grades and correlation with the questionnaire subscales using the methods of mathematical statistics.

Participants and procedure

The participants were 46 students of the 5-th year of study, from the Bogomolets National Medical University, Kyiv, Ukraine.

We used the modified version of the Motivated Strategies for Learning questionnaire (MSLQ) (Soemantri, Mccoll and Dodds, 2018). We consider this tool to be the most suitable for measuring medical students' reflection on their learning, since it helps to find out whether the students have appropriate

motivation and confidence to initiate reflection as well as to what extent they use the metacognitive skills to regulate and reflect on their learning. The modified questionnaire has four subscales: self-orientation, critical thinking, self-regulation, and feedback seeking. The self-orientation component deals with students' perceptions on their self-efficacy and internal motivation.

We held an experiment after students finished studying Pediatric Surgery course. It is obligatory for 5-th year students of I,II,II and IV Medical departments of the university and comprises 43 hours of classroom hours (4 lectures and 5 practical classes), and 15 hours of self-work. The survey was held in spring semester 2021. Students had an online mode of education taking into account the epidemic situation in Ukraine and the recommendation of the Ministry of Health of Ukraine. The classes were held according to the curriculum in real time, using videoconferencing tools (Zoom, Google Meet). All the tests and didactic materials were uploaded to the "LIKAR_ NMU" platform of distance education. Students could communicate with teachers via social networking sites, Viber, Telegram, electronic mail, etc.

Data analysis

We defined the levels of the formation of each reflective learning component (high, medium, low) taking into account the numerical values of a 5-item Likert scale (1 point – "strongly disagree", 2 points – "disagree", 3 points – "somehow agree", 4 points– "agree" and 5 points– "strongly agree"). The correlation between the levels of reflective learning and final course grades were performed using Spearman's rank correlation coefficient (r_s). The results were calculated using SPSS Statistics software.

Ethical issues

The survey was approved by the Research Board of the Department of Pediatric Surgery. Before the experiment started, students were informed about the nature of the research, the confidentiality of the observation data, their right to obtain information on the experiment results. The participants could stop the participation at any time with-out any academic consequences.

Results

Our research aimed at identifying the level of medical students' reflection on their learning in Pediatric Surgery course. We calculated the level of formation of each reflective learning component: self-orientation, feedback seeking, critical thinking, self-regulation. The results are presented in Table 1.

Table 1. The survey results (MLSQ subscales, levels, and correlation with the course grade)

Variables / Levels	Self-orientation	Feedback seeking	Critical thinking	Self-regulation
High	25 (54,3%)	11 (23,7 %)	17 (37%)	18 (39,1%)
Moderate	19 (41,3%)	22 (47,9%)	24 (52,1%)	21 (45,8%)
Low	2(4,4%)	13 (28,4 %)	5 (10,9%)	7 (15,2%)

We can see from the table that more than a half of respondents have a high level of self-orientation, which means the ability to effectively assess ones skills to master the pediatric surgery course; confidence, persistence and high level of inner motivation to acquire new knowledge and professional competence. At the same time, less than a quarter of students have a high level of feedback seeking, i.e. the ability to proactively seek feedbacks about their performance from peers and teachers; to discuss course content, perform group tasks or ask for help. High and moderate levels of feedback seeking constitute more than 70%. The assessment of the levels of critical thinking indicates that almost 90% of respondents have a high and moderate levels of formation of this construct which means that they have a high or sufficient ability to critically evaluate, analyse and synthesise course content; students with high level of critical thinking try to think of possible alternatives to the proposed by teachers or other students solutions to the problems. Our results show that almost 75% of students have a high and moderate level of self-regulation which indicates high or sufficient ability to reflect on one's learning, students with high level of self-regulation monitor and control their cognition, motivation, and behaviour in order to achieve certain academic and professional goals. Thus, we observed the prevalence of high and moderate levels in all the variables, but the results in Feedback seeking variable are considerably lower.

At the next stage of our experiment, we collected the data on students' grades and defined the correlation of final course grade with each variable. 18 students (39,1%) obtained an excellent mark in the course, 24 students (52,2%) got a good mark and 4 students (8,7%) had a satisfactory grade. We found out the strongest correlation between self-orientation, critical thinking, self-regulation and academic success (0,85 $p \leq 0,05$). The tendency will be analysed and explained in the next section of the paper.

Discussion

The primary task of our experiment was to measure medical students' reflection on their learning a Pediatric Surgery course, which was taught online due to COVID-19 pandemic restrictions, using "LIKAR_ NMU" platform and videoconferencing tools. To reach our aim, we applied the modified version of the MSL questionnaire, developed by Soemantri et al.(2018) for medical students.

We consider reflection as the process of self-knowledge aimed at understanding and assessing one's thoughts and actions. Reflection plays a crucial role for self-improvement. Our appeal to the concept of critical reflection developed by Mezirow (2009) is related to his idea that critical reflection is a key element of individual transformation. The implementation of critical reflection basic theoretical principles allows us to identify three types of objects for reflection: content, process and preconditions. Reflection on content indicates our perception of the content of the chosen activity content, thoughts and feelings about it. Reflection on the process determines the comparison and evaluation of the effectiveness of previous mental activity as well as the efforts applied to present process. However, the critical reflection itself occurs only while analyzing the preconditions that led to certain actions. Among these preconditions we outline personal learning background and experience, understanding of personal needs, possibilities and goals.

Our previous research showed that students positively evaluated the course content and structure, interface of the platform "LIKAR_ NMU" and the interactive tools like forums, chats, videoconferencing which allowed communicating with peers and the teacher in real time. At the same time assessing the learning process, students pointed out the lack of practical experience caused by quarantine measures which didn't allow attending face-to-face lessons and interact with patients, participate in surgical operations (Levitskyi et al., 2021).

The participants of the present research were 46 students of the 5-th year of study, from the Bogomolets National Medical University, Kyiv. The analysis of students' final course grades has shown that the average grade is 4,4. More than one third of all students got an excellent mark, and less than 10% received a satisfactory grade. We explain such positive results by the balanced course structure and high level of students' inner motivation and self-efficacy. Our course participants are mature 5-year students who have set their goals and want to become successful doctors in future. Thus, we witness the metacognition manifestations of preconditions reflection that correlates to self-efficacy. On the basis of previous learning experience analysis, students clearly understand their goals and ways how to achieve those goals, what tools and strategies to choose according to personal possibilities.

The measure of self-orientation component of the questionnaire revealed that more than a half (54,3%) students had a high level of its formation, and only 2 students (4,4%) had a low level. This component of the modified questionnaire comprised two subscales of the original questionnaire – self-efficacy and inner motivation (Soemantri et al., 2018). Self-efficacy and internal motivation influence on how students reflect on their learning. People with low level of self-efficacy think that they areunable to cope with course tasks and to reflect on them. Students with low internal motivation may regard reflection as unnecessary, since their focus is only on grades and examination. In contrast, students with high self-efficacy and inner motivation can successfully reflect on their learning and be successful in mastering the course (Doménech-Betoret et al., 2017; Yokoyama, 2019). We have found positive correlation between this variable and students' final course grade. Our results are in line with other studies. For example, Chowdhury and Shahabuddin (2007) revealed statistically positive correlations between self-efficacy and performance, self-efficacy and intrinsic motivation, self-efficacy and extrinsic motivation, intrinsic motivation and performance, and extrinsic motivation and performance. The authors found out that students with high levels of self-efficacy and motivation performed better than those with low levels of the mentioned constructs.

Acquisition of critical thinking skills will allow students to reflect on their learning. In mastering the course content, a student needs to analyse a particular learning process as an effort to understand more about the learning, which will lead into reflection on learning (Halpern, 1996). We have found that almost 90% of students have high and medium levels of critical thinking with the positive correlation with the final grade. Our results are supported by other scientists (Liashenko, 2020; Eğmir and Ocak, 2020). Scott and Markert (1994) discovered that critical thinking skills were predictive of academic success during the preclinical years of medical education. It should be emphasised that critical thinking skills contribute to the development of "clinical thinking" regarded as professional thinking, which is formed under the influence of professional knowledge, personal experience and reflection on quality of professional performance.

The next component is self-regulation that is highly interrelated with critical thinking aspect. Self-regulation presupposes the perception of a learning process and its regulation through planning and monitoring in order to achieve the intended goals (Soemantri et al., 2018). Students with high level of critical thinking are able to analyse more critically the learning process which leads to better self-regulation. We have found that

85% students have a high and moderate level of self-regulation. The correlation with an academic success is positive, which is in line with other studies (Lucieer et al.2016; Zheng and Zhang, 2020).

The last component is feedback-seeking behaviour. Reflection is not purely an individual process, it cannot be based on self-assessment only. Reflection requires processing and incorporating external data in the form of feedback (Bound et al., 1985; Kember, 2001). A student with better feedback-seeking behaviour might have a more accurate reflection on learning, because he or she continuously looks for feedback to refine and improve the reflection (Soemantri et al., 2018). Our results have shown lower indicators of this variable, comparing to other reflective learning components. Although this is an extremely important component in academic performance and reflective learning, this construct was influenced by the specificities of online learning. Students are isolated and have no opportunity to communicate face to face in an informal mode. Online videoconferencing tools also have some restrictions. That is why the students get more feedback from the teacher, but not from peers. In this situation we recommend teachers implement peer and self-assessment techniques in the online and offline classroom. The application of peer and self-assessment methods improves students' critical thinking skills, involves students into learning and assessment processes, keeps motivation up to study and provides them with a greater ownership of the whole learning and assessment process (Lavrysh, 2016). The main idea of this transformation is that the higher the ability of students to critically analyse their activities and results, the higher the ability to assessment, and especially self-assessment. As students' ability to self-assess increases, their dependence on the authority of the teacher and the opinion of others about the progress decreases, accordingly the degree of learning independence increases. Therefore peer and self-assessment techniques could be effectively implemented in the Pediatric Surgery course.

Based on the study of scientific sources (Kayley et al., 2020; Essel, 2020) and the results of our experiment, we have developed the methodological **recommendations** for medical educators performing in online learning environment. Mostly all videoconferencing tools suggest options for demonstrating feedback on activities. It is recommended to use these options as answers to reflective questions: did you understand the topic? Do you find the information relevant? Whether learning activities were helpful? Another suggestion is to perform discussions on students' results after performing the online learning activities. A great number of online learning tools provide immediate feedback after the completion of the task. Therefore, it is helpful to discuss with students the results, whether students understand why they received exact grades, if students agree with the grade, if students can explain the cause of a mistake and how to correct it. An awarding strategy is to employ alternative assessment strategies: self-assessment and peer-assessment. Students are taught how to choose criteria for the assessment, what key skills and knowledge are important, strategies to improve their academic performance. It is worth mentioning that digital learning tools address students' diversity and by means of these tools we are able to create teared learning activities differentiating them by levels of difficulty. In order to develop reflective skills, suggest students to choose the level of the activities themselves. In a such way we can understand how students assess and perceive their abilities and possibilities. A beneficial recommendation is to design multitasking activities when students have to provide feedback to proceed to the next activity and navigate the subsequent stages of the task. It is better to design such activities using authentic clinical cases discussions when students should answer the reflective questions after every doctor's manipulation or solution. In this case, students are able to reflect on the content of the problem, the treatment process and the quality of outcome.

As key strategies for teaching students proper feedback we have outlined constructive teacher-students dialogue on criteria and goals of the assessment, explain the learning potential of the feedback, always correlate the results with the learning goal, design feedback activities that promote future self-management skills development, allow students to choose the topics for discussion, level of complexity, criteria and timing for the activity, ensure that summative assessment is aimed at further learning, so called "feed-forward" approach.

Conclusions

We define reflection as the ability of an individual to be aware of the results of personal learning activities, to set the boundaries of this activity for solving a learning task, to adjust goals with strategies and possibilities. Our results have proved the correlation between the components of reflection (self-orientation, feedback seeking, critical thinking, self-regulation) and students' success in learning. Although most students have high and moderate levels of the above mentioned constructs, we observed the lower results according to the subscale "feedback seeking", which indicates the necessity to adopt interactive tools in online and blended learning aimed at providing constructive feedback during online conferences as well as self-assessment and peer-assessment based on the previously defined and discussed criteria.

As a result of reflection teaching, students are aware of successes and failures in defining strategies and choosing learning tools, develop a critical attitude to personal capabilities, skills and resources. Critical reflection in professional field carries the potential for self-development and self-realization, which under certain conditions allows the individual to rise to a new level of progress. It has been determined that the high level of reflective skills is the key to perform constructive learning with building new knowledge based on previous experience. Through the reflection students received information for analysis, consider self-awareness as a subject of study, design the strategies for future progress. Reflection plays an important role in the educational activities, as it helps students to quickly plan and perform the educational task, to act as an expert in their own educational activities, to critically evaluate and verify the results obtained, as well as to conduct effective, independent work with sources of information. Our future research will deal with the studying and designing reflective activities which can be implemented in students' practical classes.

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Received:15 September, 2021
Accepted:1 December, 2021