

Original Research Article

Exam wrapper and metacognition for undergraduate surgery students in exam preparation

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ABSTRACT

Background: An exam wrapper is a structured debriefing questionnaire tailored to help the students understand their performance in the examination and help them to plan and develop improvement strategies. Exam wrappers give students a structured reflection about how they performed in a particular exam and act as a useful tool to perform better in the next exam. This mixed-method study was conducted to assess the impact of exam wrapper on metacognitive skills of surgery students and to assess the perception of students on its application in exam preparation.

Methods: Metacognition was assessed using the metacognitive inventory questionnaire for students learning surgery. Nonparametric Friedman test was used to analyze quantitative data and qualitative data which were collected from four identified focus groups students who completed the exam wrapper sessions.

Results: Students who used the exam wrapper throughout the semester demonstrated appreciable improvement in metacognition ($p=0.013$). Focus group data showed that students found the exam wrapper useful and effective. The analysis revealed the students' trust that, the faculties can make a change, complementary to conventional teaching-learning methods and reflecting the exam paper helps them to perform better.

Conclusions: Medical students in surgery perceive this tool as useful and their application of exam wrapper as an effective tool in metacognition. This type of metacognitive intervention needs to be adopted across different departments for exam wrapper to be more engaging and direct students towards self-directed learning.

Keywords: Metacognition, Surgery students, Exam preparation, Self directed learning

INTRODUCTION

Exam wrapper was first described by Achacoso in 2004 as a way for students to analyze their test performance and reflect on and understand their examination performance. He reported that exam wrappers increased metacognitive awareness in students, and helped the students to perform better on subsequent examinations.¹ Exam wrappers found to be useful in recognizing effective study habits, understanding, and application instead of just memorizing material. An exam wrapper

works by giving metacognitive inventory questionnaire to students after an examination, allow them to predict their performance and then self-reflect on how the preparation helped them in the examination. This initial step helps the students to correlate between their performance and effort put. The next step involves asking students to apply learning strategies while preparing for the next exam and to consider what they might consider doing differently in preparation for the next examination.² An exam wrapper involves a guided self-reflection into an exam already undertaken, encourage the students to analyze their

preparation methods, consider what went wrong, and what to be done to perform better, how to plan and execute it in the next exam. Posttest analysis is short reflective writing activities which ask the students to review their study strategies relating to their performance with a focus on future plans.³ However; more studies in different subjects needed to validate exam wrapper as an educational tool on improvements in knowledge and metacognition capabilities.⁴ The value of exam wrappers has been demonstrated in some studies however, point of concern is that medical students need to develop examination self-reflection skills earlier than later.⁵ Not many studies have examined if there is a difference in metacognitive skills before and after the use of exam wrappers over time. The purpose of this study was to examine the impact of the exam wrapper on student metacognition in an undergraduate surgery class and to assess the students' perception of the utility of this tool.

Aim

Aim of the current study was to determine whether the exam wrapper is an effective tool to improve surgery students' metacognition skills, and to analyze student's perceptions on the of exam wrappers as an exam preparation tool

METHODS

Study design and participants

Mixed-model study (qualitative and quantitative) approach was undertaken at the department of general surgery, Karpaga Vinayaga institute of medical sciences and research centre Chengalpattu, Tamil Nadu, from 2018 September to December for students in their final semester. For the quantitative study, a longitudinal study design was devised using the metacognitive inventory for surgery students with (questionnaire with 5 points Likert scale) to assess student metacognition. The Likert scale questionnaire consisted of 5 points (1=never to 5=always) to measure the relationship between students, knowledge and level of awareness, their thinking and behaviours. In 2010 Hsu has developed a 28 item tool with five subscales, self-monitoring, self-modification, self-awareness, effective learning and problem-solving with a total score range of 28 to 140, with higher scores indicating greater metacognitive ability. Cronbach's alpha coefficient reported for this tool is 0.94 for the total scale and 0.73 to 0.90 for the five domains. This scale was administered to enrolled surgery students (n=100) in their final year MBBS of which 92 participated in the baseline study (n=92). Subsequently, after each of the three consecutive internal assessment examinations, students were also asked to submit the exam wrapper questionnaire. For the qualitative part of the study students who had completed at least one exam wrapper was formed in to focus group at the end of the semester to assess their perceptions of exam wrappers. (3 groups of 4 each) (Figure 2).

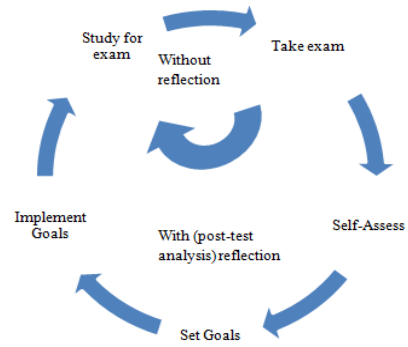


Figure 1: Exam wrapper.

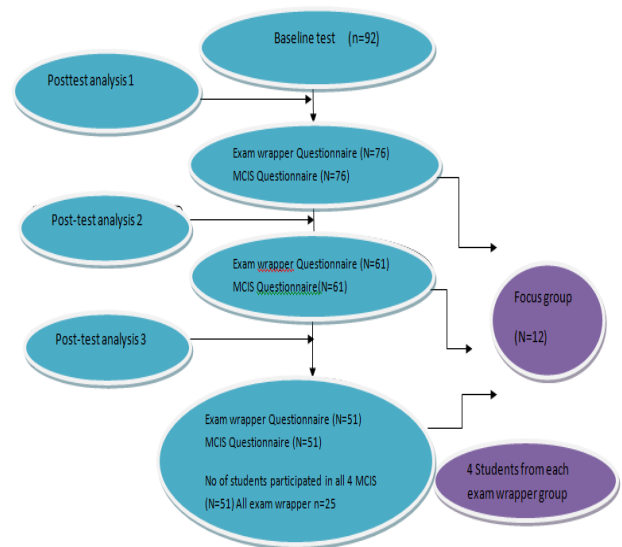


Figure 2: Study design.

Inclusion criteria

Inclusion criteria for current study were; students in final MBBS surgery programme, students participated in all internal assessments and students completed one exam wrapper minimum.

Exclusion criteria

An exclusion criterion for current study was students not interested to participate in study.

Study population was done using convenience sampling. 100 undergraduate students in surgery of this teaching hospital included in the study. Both the exam wrapper and questionnaire were given in the next class following each examination by the principal investigator who was not part of the teaching faculties. The focus groups were led by the same principal investigator at the end of the semester consisting of Self-reflection questions used for the exam wrapper were based on work of Lovett (2013), used as an interventional tool in this study. Students were

asked to reflect on time spent for exam preparation, strategies if any used to study for the examination like group study, videos, reference books, and focusing on online presentation notes. Simultaneously students were also asked to reflect on silly mistakes, blunders made on the examination and to consider what they would do differently in preparation for the upcoming examination. The aim was to make the students consider their examination performance concerning their preparation and as a way of correlating the outcome.

Consenting students who completed a demographic questionnaire and the metacognitive inventory questionnaire in surgery at the beginning of the semester formed the study group (n=92). To assess student perceptions of the exam wrapper, (qualitative analysis) students who have completed the exam wrapper at least one time were allowed to participate in a focus group. A total of four students in each group participated in the 30-minute focus groups discussions moderated by the principal investigator, with open-ended questions to know the perceptions of students about the value of exam wrappers in improving their performance. Focus groups were limited to only four students for each Posttest analysis to ensure that all students got equal opportunity to give their opinion. Each focus group discussions was recorded and transcribed subsequently.

Data analysis and interpretation

Quantitative data analysis was done using SPSS version 24, with descriptive statistics at each time point. The nonparametric Friedman test used to determine the extent to which metacognition was enhanced over time using differences between related samples. The dependent variable (response) was the total score of metacognition and the independent variable was time. Systematic content analysis of the focus group was for the qualitative data, completed with Krueger's and Casey's framework. The first step started with summarizing the discussion, and at the end of the focus group asking the participants for confirmation. The next steps consisted of viewing video recording, reviewing logs, transcripts reading, preparing a report in a question-answer format.

Transcribed focus group responses were analyzed for relevant statements related to utility and accepted value of the exam wrapper. Segments were grouped based on commonalities within the descriptions provided by the students in surgery. Lincoln's and Guba's framework was used to establishing qualitative scientific criteria of conformability, credibility, dependability, and transformability. Credibility was established through debriefing, and member checking with participants with each focus group at the end. Triangulation was achieved by comparing data across four focus groups and comparing the data to the principal investigators' observations and perceptions documented in the reflective field notes. Dependability was achieved by using an audit trail of all

methodological and analytical decisions, and descriptions of the data maintained for transformability.

RESULTS

A total of 92 students voluntarily participated in this study out of 100 students enrolled. Number of students completing both the MIS and exam wrapper questionnaire remained variable after each examination: baseline (n=92), after the first examination (n=76), after the second examination (n=61), and third examination (n=51). Only 25 students completed the MIS questionnaire at all four-time points during the semester, and 51 students completed the exam wrapper throughout the semester. Few students completed the MIS and then dropped out. Demographically, a majority (58%), of the students were female, and male students were (42%), living in an on-campus hostel (95%), with a mean age of 20 years (Figure 3). Mean metacognition scores found to be 80.5 at baseline, after the first test it was 81.8, after the second test 82.5 and 86.5 after the third test (Figure 4). The mean metacognition scores continued to increase over time. The Friedman nonparametric test revealed that overall student metacognitive skills were enhanced over time (p=0.014).

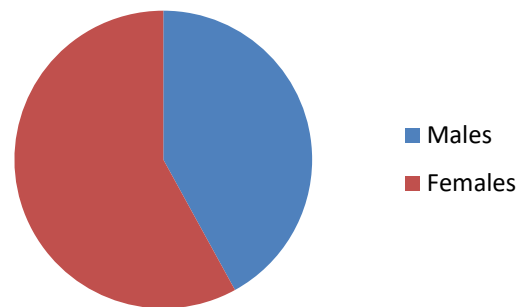


Figure 3: Ratio of men and women

Twelve students who had completed at least one exam wrapper participated in one of four 30 minute focus groups. Systematic analysis of focus group transcripts showed that though a few students reported the exam wrapper tool was helpful, a majority (n=9) of the students shared they found exam wrapper helpful. The important findings emerged as reasons for finding exam wrapper helpful are dedicated teacher, complementary to other exam preparation strategies, and easy to reflect after the test they took. Nearly all the students showed a strong reliance on their teacher for understanding why scored less for help and ideas for improving performance for the next examinations. The suggestions included group study, flipped class, and mind map, group study, listening to videos going through key points before class, and taking better notes. Eight of the students in the focus groups felt the exam wrapper was useful because it helped them to reflect on the queries in the exam wrapper as it was done immediately after the test. Schuler et al concluded in their studies on nursing students perceived this as a useful tool

as, unless used repeatedly over time. But in our study, our students in surgery found this very useful in their summative exam preparation. Lovett in her study also concurred that the use of exam wrappers helps to enhance metacognition and successfully used in college courses. Structured reflections after examination were disbursed, to help metacognitive development. Gezer-Templeton, Mayhew, Korte and Schmidt found a relationship between the use of exam wrappers and improved examination performance in introductory food science and human nutrition course. In nursing, the use of exam wrappers has been described as a useful tool to help students study and prepare for examinations and facilitate student retention and success. A recent qualitative study by Butzlaff, Gaylle, and O'Leary Kelley demonstrated the value of exam wrappers in helping students become more active participants in their self-directed learning.

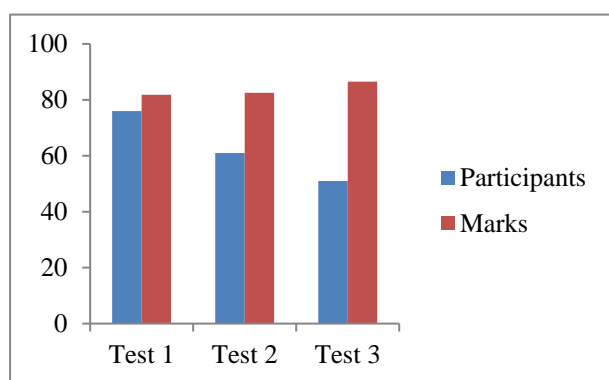


Figure 4: Metacognition of students.

DISCUSSION

Our quantitative study validated the use of exam wrappers in enhancing student metacognition in learning surgery. Metacognition involves a student's capability to grasp, understand the concepts, and effectively apply what they have learnt.⁶ Butzlaff et al in their study conducted in 2018 found the value of exam wrappers not only in enhancing student preparation for the examination but also its relationship with metacognition. Worrell mentioned that exam wrapper involves planning and reviewing your strategies to be effective. The success of this exam wrapper in metacognition is based on self-awareness, dedicated teacher and reflection on the examination at the earliest. Students used the exam wrapper showed significant improvement in their metacognition score, an exam wrapper is an easy-to-employ tool for the students to improve their test preparation and performance. Exam wrappers make the students aware of their strength and weakness and better prepared for their next exam as suitably structured reflections, along with post-test analysis with faculty help in metacognitive development.⁷ Both quantitative and qualitative results of our study support the use of exam wrappers in improving motivation and its utility in developing metacognitive skills. Similar studies have shown that there is qualitative evidence that students

successfully reflect on past behaviour and recognize improved study strategies that will help them.⁸

Previous research has indicated that an intervention called exam wrappers can improve students' metacognition when they are using wrappers in more than one course per academic term. In this study, we tested if exam wrappers would improve students' metacognition and academic performance when used in only one course per academic term. A total of 86 students used either exam wrappers (an exercise with metacognitive instruction), sham wrappers (an exercise with no metacognitive instruction), or neither (control). We found no improvements on any of three exams, final grades, or metacognitive ability, measured with the metacognitive awareness inventory (MAI) across conditions. All students showed an increase in MAI over the semester, regardless of condition. We discuss the challenges of improving metacognitive skills and suggest ideas for additional metacognitive intervention.

Qualitative findings also proved the importance of having a dedicated teacher in the success of this concept of exam wrapper. Oden Weller, Booth-Butterfield, and Weber in their study suggest faculty can provide the support and help the students with their expertise. This method is used as a complementary practice for exam preparation this will not replace other teaching-learning methods in place in the curriculum. Though innovative teaching methods such as flipping the classroom, Google classrooms have been shown to engage student's critical thinking abilities and provision for feedback students continue to prefer having teachers in traditional classroom teachings, such as lecture, despite being didactic and less interactive engagement. Faculty have an opportunity to apply exam wrapper with students to reinforce the value that classroom engagement gives, which will help the students' not only knowledge retention but also being interactive and in the assessment. Students in this study group who used the exam wrapper consistently showed improvement in metacognition over time. The improved metacognition scores have to be sustained over time with the interaction between teachers and students and facilitate self-directed learning by the student.⁹ when we guide the students to self-reflect on their strengths and weakness and help them to devise a strategy for improvement, they will be motivated to be better learners. Medical teachers can use exam wrapper as a tool to make surgery students in self-directed learning through self-reflection debriefing.¹⁰ Students prefer doing to observing, they want to be given clear expectations and responsibility for their work tasks, they want to work in a team, they prefer to they want to work in a team, they prefer to self-evaluate before feedback.¹¹ The utility of exam wrappers is that it helps the students as a pedagogical practice, self-directed learning and has a positive and statistically significant effect on the students' metacognition score.¹²

Limitations

Limitations of current study were, study was conducted without a control group and in only one semester of undergraduate students enrolled in this experimental study. Application of exam wrapper in more students in different batches needed to assess change in metacognition scores.

CONCLUSION

The results of this study indicate that students in surgery perceived the exam wrapper as a useful tool in their preparation for summative exams and an effective exercise in improving metacognition scores. Even though medical students continue to rely on the teachers for feedback and guidance to better their performance, the exam wrapper can be important to tool for improving their metacognition for surgery students and help them in their self-directed learning. Exam wrappers should be considered in all subjects as a tool in self-directed learning in medical education. With early exposure and repeated use, students may deem this tool to be an essential component of their learning. Posttest analysis and reflection (exam wrappers) were found to be an effective tool by the students and the teaching team as well to improve self-assessment, goal setting and achievement of self-regulation skills, which will lead to improved metacognitive knowledge.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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