Introduction of student-led physiology tutorial classes to a traditional curriculum

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The curriculum of the University of Ruhuna Medical School (Galle, Sri Lanka) is of a discipline-based, traditional type. During the first and second years of their 5-yr study period, students learn physiology, anatomy, and biochemistry. The teaching activities in physiology consist of formal lectures, practical sessions, and tutorial classes. Most teaching activities are led by faculty members, and students act as passive recipients. Tutorial classes are usually conducted as traditional tutorials (TT), which are led by faculty members. Students get a limited opportunity to express their opinions and enhance their communication skills during tutorials in the first 2 yr. Teaching is conducted in English in this medical school, although English is not the native language of the students.

There is a continuous process of modifying the curriculum and teaching-learning activities of this medical school to improve the quality of the graduates. Faculty members and administrators of this medical school felt the need to improve students’ self-directed learning abilities, teamwork, and communication skills. Since a student-centered learning process was considered to improve certain aspects of skills and attitudes, such as teamwork, self-directed learning, communication skills, cooperation, respect for colleagues’ views, etc. (10), student-led small-group classes (SGCs) were introduced as a teaching-learning process in physiology. This was implemented as a Plan-Do-Check-Act (PDCA) process, and, depending on the outcome of the SGCs, we planned to refine the process further. The initial aim was to introduce a student-centered learning process in small scale within the traditional curriculum.

The SGC consists of a learning process in which students use a case or a scenario to discuss the subject with wide student participation. Faculty members are available to answer questions and moderate and guide the discussion, if necessary. SGCs are different from problem-based learning (PBL) tutorials as the number of students in a class was higher than in a typical PBL class and there was only one tutorial session for each case or problem. Typical PBL tutorials with the participation of a small number of students could not be adopted in the initial stage due to limitations of human and physical resources in this medical school. It has been shown that considerable number of medical schools with traditional curricula have incorporated a significant amount of student-led group teaching sessions into their undergraduate programs (6).

The aim of this study was to assess student perceptions on the newly introduced SGC and compare them with those from the TT. We are planning to alter the process depending on feedback from the students and staff.

MATERIALS AND METHODS

A total of 129 medical undergraduates in their first and second terms participated in the study. There were 70 men and 59 women (age: 20–23 yr old). They were selected for this medical school based on their performance at a national-level competitive written examination. Usually, those who receive higher ranks in biology enter into medical schools. Teaching activities in this medical school are conducted in a term-based time frame (i.e., 3 terms/yr). The SGC was conducted in the first term, and the TT was conducted in the second term. A case was given at the beginning of the tutorial class in the SGC. However, students were aware of the broad subject matter of the case before the SGC. Formal lectures (by faculty members) were conducted parallel to the SGC to help students learn the subject material discussed in the SGC. The cases used were broader and were more of a problem solving type. As an example, the following statement was used to trigger discussion: “Coagulation status is more of a problem solving type. As an example, the following statement was used to trigger discussion: “Coagulation status is...” The structure of the SGC consisted of several segments: clarifying concepts and explaining difficult words, defining the problem or deciding the boundaries, brainstorming and systematic classification, and identifying further
How We Teach

The staff member acted as a facilitator. The chairperson or leader who conducted the SGC was appointed from among the students (a peer in the same class) at the beginning of each class. During brainstorming, students generate different ideas/opinions and classified them systematically. Finally, further study areas related to the case or problem were identified. Important information discussed was recorded on the whiteboard by students. Students sat in a circle. The duration of one SGC was 2 h. However, there was no dedicated time for private study or sharing the knowledge gained from private studies like in a typical PBL tutorial (10).

The SGC was first introduced while students were engaged in a communication skills module in the introductory course, which is the first course that students take at this medical school. This introductory course was held a few weeks before the SGC in physiology commenced. Students were given directions and were trained for the SGC using nonmedical topics during the introductory course. The advantages, structure, and directions were explained again at the beginning of the physiology SGC. The importance of active participation by students was emphasized.

Unlike the SGC, specific questions to be discussed in the TT were displayed on the notice board a few days before the TT. The questions were well focused and similar to those given as essay-type questions to assess the theoretical knowledge of physiology in the examination. As an example, the following question was used.

Give physiological reasons for the following:
A. A soldier who stands to attention for a long period may faint.
B. Occlusion of both carotid arteries causes a rapid rise in aortic blood pressure.
C. A carotid sinus massage causes a drop in systemic arterial blood pressure.
D. Patients with increased intracranial pressure develop hypertension with bradycardia.

It was compulsory for the students to prepare and come to class with a written answer. Faculty members conducted the tutorial, and usually a few students were randomly selected by the faculty members to read their written answers. Students sat in rows with the faculty tutor at the front. The number of students per group/class was 15–20 students for both the SGC and TT, with an average of 17 students/class. Five classes were conducted for each type (SGC and TT) for each group. The subject areas of the SGC were the physiology of blood and body fluids, whereas those of the TT were respiratory and cardiovascular physiology.

The study was conducted using a mixed qualitative and quantitative method since we believe that both methods are important in collecting student perceptions. We designed a questionnaire that consisted of eight statements (Table 1) to obtain quantitative data. Students were requested to select their choice from a Likert-type scale of 1–5 (where 1 = “strongly agree” and 5 = “strongly disagree”) for each statement. There was a separate question where students indicated their preferred tutorial type. Students were asked to describe their reasons for selecting their preferred tutorial type in as much detail as possible. This self-directed questionnaire was distributed among all the students at the end of the last tutorial in the second term. All participants were informed about the purpose of the study.

Student participation in the study was voluntary. Face validation was done for the questionnaire.

Responses to each statement were categorized into three groups according to selection by the five-point Likert scale from strongly agree to strongly disagree. These categories were 1) agree (those who selected 1 and 2), 2) neutral (those who selected 3), and 3) disagree (those who selected 4 and 5). For each statement, a 3 × 3 table was prepared using the three categories mentioned above, and a χ²-test was used to compare student responses for the two tutorial types.

We explored the students’ experiences in the SGC and TT by analyzing their reasons for selecting the preferred tutorial method using a qualitative research method (2). All answer sheets were read thoroughly several times by two investigators to get familiar with the content. The investigators went through them and determined the three main categories with mutual agreement. The investigators separately prepared a list of “meaning units” under each category, extracting the meaning from the text. In this process, “raw” descriptions from students were transferred into the investigators’ language to identify key information. Later, the two investigators discussed each meaning unit and prepared a common list. In this process, some similar meaning units were combined to make one meaning unit with more clear and straightforward meaning. Both investigators went through all the answer sheets again to make sure that gathered all the information and to resolve disagreements between them. The meaning units were condensed, synthesized, and assimilated into description of themes under three categories.

RESULTS

The response rate was 93.02% (120 of 129 students). All statements comparing the TT and SGC showed significant differences. The most agreed tutorial type was identified for each statement using a χ²-test, and the results are indicated in Table 1. For example, students agreed more with the statement “preparation was easy” in the TT, whereas students agreed more with the statement “Learning is superficial” in the SGC. When the responses to the question on preferred tutorial type were analyzed, we found that 80% of the students preferred the TT over the SGC.

The investigators went through the descriptions of student experiences in justifying the selection of the preferred tutorial type. Three categories were identified: appreciation of the SGC, attachment to TTs, and suggestions for improvement. Descriptions of these categories are given below.

Appreciation of the SGC

Several themes were identified under the appreciation of the SGC: opportunity for discussion, quality of the knowledge, active participation, improvement of presentation ability, and increased breadth of knowledge.

Opportunity for discussion. Discussion among students was a highly valued feature in the SGC. Students appreciated wider participation and active involvement in the discussions. Collaborative teamwork effort with greater contributions from students with more knowledge was mentioned as an advantage.

Table 1: Student responses to each statement

<table>
<thead>
<tr>
<th>Statement</th>
<th>Tutorial Type</th>
<th>P Value (by χ²-Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation was easy.</td>
<td>TT</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Learning is superficial.</td>
<td>SGC</td>
<td>0.006</td>
</tr>
<tr>
<td>Learning is deep.</td>
<td>TT</td>
<td>0.001</td>
</tr>
<tr>
<td>The environment is threatening.</td>
<td>SGC</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>I can go unnoticed by staff members.</td>
<td>SGC</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>The amount of knowledge is worth the time spent.</td>
<td>TT</td>
<td>0.003</td>
</tr>
<tr>
<td>The staff member handled the class well.</td>
<td>TT</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Shown are the statements used in the comparison of the traditional tutorial (TT) with the student-led group class (SGC).
The following are comments by students:
- “People who have good knowledge give a good support (in discussion) and it helps to improve knowledge of others.”
- “We can clear some subject matters by discussing.”

Quality of the knowledge. Some students felt that they obtained greater knowledge and remembered the subject better with the SGC. One student used the word “profitable.” He may mean that the knowledge was worth the time and energy spent in the SGC.

The following are comments by students:
- “We get more profitable knowledge with discussion.”
- “SGC is [the] most remembered method.”
- “We exchange knowledge with each other to understand the subject better.”

Active participation. Students mentioned active involvement in the problem-solving process. They highlighted a deficiency in writing a compulsory answer for the TT, where students have the opportunity to copy the content from textbooks without active involvement.

The following are comments by students:
- “Students are actively participating, gathering knowledge and solving the academic matters [problems] about the subject.”
- “SGC [was] associated with huge active participation.”
- “There was nothing [in TTs] but only reading the answer which is copied or simply modified from a book.”

Improvement of presentation ability. Students understood the clear difference between merely reading a written answer and presenting an idea in a discussion. The opportunity to improve presentation skills was appreciated by the students.

The following are comments by students:
- “In SGC every student can get a chance to present their ideas, but in TT only few students get a chance to present.”
- “In traditional tutorials, most of the time we read the answer while others are just listening.”

Increased breadth of knowledge. Some students mentioned that a wider subject area was covered in the SGC, where the discussion was broad and general in scope. In the preparation for the SGC, students read the whole lecture notes or the whole chapter of the textbook rather than just preparing an answer to a given question in the TT. The SGC allowed students to extend the discussion to a wider area, which is an example of providing some responsibility to the students for their own learning.

The following are comments by students:
- “In SGC, we have to prepare not for a question, but for a topic which covers a huge area. So we read and get a large amount of knowledge.”
- “SGC allows us to wind up a vast area of the topic and to gain more with help of brainstorming of all the members.”

Attachment to TTs

Several themes were identified under attachment to TTs: focused learning for examinations, written preparation, and more tutor involvement.

Focused learning for examinations. Students pointed out that a considerable portion of the examination consists of written answers to questions. Writing an answer in the TT is training for the examination. Students highlighted that writing down anything makes them remember it better. They seemed to consider the tutorial as incomplete without something in writing. Students appreciated the questions used in the TT, which are similar to the questions given in the main examination.

The following are comments by students:
- “It [TT] helps us to well prepare for the 2nd MBBS examination.”
- “Because of writing answers, we are able to gain more knowledge and help us in remembering the things that is done at the tutorials.”

Written preparation. Students considered that writing mandatory answers provided good preparation, which helped them to acquire the maximum benefit from the tutorial. Writing answers was associated with referring to textbooks and lecture notes and led students to more focused and specific preparation.

The following are comments by students:
- “Preparation has become compulsory, so automatically we tend to self-study.”
- “In [the] traditional method, we can prepare and come. So we can clear about what we don’t know in the tutorials. We can gather more information before we come to the tutorials.”

More tutor involvement. Students wanted more tutor involvement and more didactic teaching in tutorials as in lectures. Some of them seemed to be reluctant to accept teaching done by anybody other than the tutor.

The following is a comment by a student:
- “We can learn more from the [academic] staff members... If [academic] staff members teach it again in the tutorial, it is worth [it] to us.”

Suggestions for Improvement

Two themes were identified under suggestions for improvement: 1) suggestions to incorporate mandatory written answers in the SGC and 2) more contributions from faculty members.

Incorporate mandatory written answers into the SGC. Students suggested that the SGC should contain mandatory written answers.

The following is a comment by a student:
- “I prefer if we had the preparation and writing an answer in SGC, so we spend our time in studying to answer the tutorial and then discussing it in front of all the group members.”

More contributions from faculty members into the SGC. Another suggestion was to increase contributions from the tutors in the SGC. They wanted the tutor to use the overhead projector and explain the subject, as in a lecture.

The following are comments by students:
- “SGC is good, but it should be achieved with additional knowledge given by more participation [from the] teacher.”
- “Unclear points of the lectures should be discussed in SGC.”

DISCUSSION

Students appreciated the opportunity for discussion in the SGC, which was offered to them for the first time. Some students considered the discussion as a better knowledge-acquiring process (one student used word “profitable”). Discussion helped them to understand unclear areas in their previous studies. They felt that they remembered the subject...
well after discussing it in the SGC. The SGC allowed students to
discuss about previous knowledge and perceptions on the subject
that they gained through books and lectures. It also allows them to
clarify misunderstandings on the subject. Learning can be further
developed or sharpened from that point.

The students decided the extent of the study area for the
SGC, and they led the discussion according to it. This provides
responsibility in their own learning, which is an adult approach
toward learning. This skill is important for the rest of their
professional life in developing as a continuing learner. In the
preparation for the SGC, students prepare for a wider area,
such as reading the whole lecture notes or a whole chapter of
the textbook, and some students considered it as an advantage
rather than just preparing an answer to the given question in the
TT. Therefore, some students seemed to consider that the SGC
helped them to acquire wider knowledge than the TT.

Collaborative team work was an appreciated feature of the
SGC. Students with more knowledge helped more in the
discussion and led the whole group to acquire wider subject
knowledge. Students appreciated the opportunity to improve
their presentation skills, which is one aspect of communication
skills required as a medical professional.

Active participation was an appreciated quality by students.
They understood the difference between passive participation
in the TT in contrast to the SGC. Students were involved in a
critical-thinking process while solving problems related to the
subject matter in the SGC. It appears that SGCs help to
improve critical-thinking and problem-solving skills, which are
much-needed skills for a medical professional.

However, the quantitative data from this study showed that the
majority of students preferred the TT over the SGC. More stu-
dents considered the SGC as a superficial learning process com-
pared with the TT. Although the meaning of superficial and deep
learning may be different for each student, it is clear that there was
a considerable preference for the TT. This finding is contrary to
the expectation we had when we were designing this PDCA
process. Students considered writing an answer as a mandatory
preparatory component in the TT. Since 25% of the final grade is
allocated for the essay component in their main examination,
students used this mandatory answer writing activity as a pre-
paratory exercise for answering essay questions. It has been shown
in a previous study (9) that adults prefer assessment-oriented
learning. They pay less attention to nonassessment-oriented activ-
ities. Therefore, the assessment methods should be more focused
on higher-order cognitive skills such as problem solving, analysis,
and synthesis or application with considerable emphasis on skills
such as team skills, communication skills, and researching to
increase student motivation in student-centered learning (10).

More tutor involvement, which was highly appreciated by the
students, could be one reason for the higher preference for the TT.
Due to previous passive learning practices, students are not trained
for self-directed or student-centered learning. They wanted more
content, explanations, and clarifications from tutors. It seems that
students considered that learning from tutors is superior and deep.

The majority of students felt that the SGC was a more
threatening learning process than the TT. Unlike in the TT,
every student in the SGC is supposed to actively contribute to
the discussion. These students are used to passive learning
during their primary and secondary education. Most compo-
ments in this traditional curriculum-based medical school are
also passive learning activities. The data, when analyzed qual-
itatively, also showed that students wanted to be passive
learners and wanted more didactic teaching. Switching from
tutor-centered passive learning to student-centered active
learning might have been perceived as a “threatening” process,
in contrast to the attitudes of students in previous studies
conducted in some other places (7, 8). Furthermore, most Sri
Lankan students have a tendency to refrain from expressing
opinions directly in tutorial classes due to various cultural
restraints, which may be similar to what has been described for
other Asian students (1, 4, 5). The cultural reticence is a
well-documented obstacle in conducting this type of student-
led teaching activity (1, 4, 5).

We are planning to introduce an assessment system to assess
problem-solving, synthesis, and application skills together with
communication and teamwork skills in the second step of this
PDCA process. A 360° assessment system will be introduced
for the SGC process, where the tutor and all the students will
be involved rating certain skills in the class. 360° assessment
allows feedback from many people around the students to be
obtained, which includes feedback from peers, the tutor, and
the individual student in the process of the SGC. In the next
step, it will be practiced as formative assessment, and we are
planning a summative assessment in the future.

Students believed that tutors did not handle the SGC prop-
perly compared with the TT. Tutors were poorly trained and less
experienced in the SGC. TTs have been conducted in this
medical school for years, and the tutors were familiar with
traditional teaching methods. Therefore, there were difficulties
in terms of the tutors adapting to new teaching methods where
they have to act as facilitators rather than traditional tutors. We
are planning to introduce compulsory tutor training under a
staff development program for all the tutors in the next step of
this PDCA process.

Numbers of students per group were higher than what have
been suggested for these types of student-centered activities
(10). However, it was not easy to have smaller groups with the
resources available in this medical school. The Department of
Physiology has a limited number of tutors. The temporary
recruitment of external tutors was not possible with the limited
funds and administrative barriers. The availability of class-
rooms and other physical resources was also limited due to
financial constrains. As previously described, student-centered
leaning activities are expensive and adopting them in develop-
ing countries is not easy (3).

Adopting typical student-centered tutorials to the present sys-
tem in this medical school is a challenge even though it has been
practiced successfully in many other places. Students have sug-
gested combining favorable features from both the SGC and TT.

Since students requested the incorporation of written answers into
the SGC, we are planning to introduce an activity of writing an
answer to a question given at the end of the SGC. As students
mentioned, that will be training for them to write an answer to
essay questions in the examination. In the next step, the SGC will
include components from the TT to make a hybrid that, we
believe, is more suitable for the present curriculum in this medical
school. This will help students to acquire the well-recognized
skills and attitudes of student-centered learning under the existing
system.

In conclusion, the students recognized several favorable fea-
tures of the SGC and appreciated them. However, the majority of
them preferred the TT despite the highlighted benefits of the SGC.
Assessment methods that are not aligned with the SGC and ingrained passive didactic teaching-learning methods by students and faculty members both had a negative effect on the implementation of the SGC. Cultural and economical factors also contributed adversely. In the next stage of this PDCA process, we are planning to introduce a new formative assessment process. Some components from the TT such as writing an answer to an essay question will be incorporated into the SGC. We hope that these changes help to incorporate well-recognized skills and attitudes of student-centered small-group learning into the existing traditional curriculum.

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DISCLOSURES

No conflicts of interest, financial or otherwise, are declared by the author(s).

REFERENCES

1. Ahn D. Visiting elective students at the University of Toronto from the Korea University Medical College. Med Educ 33: 460–465, 1999.