



## The hybrid model of clinical skills teaching and the learning theories behind it

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Abstract

**Introduction:** There are two popular methods of clinical skills teaching. One is Peyton's method, and the other one is Robert Gagne's method. A hybrid model which is a combination of both teaching methods is developed and implemented at Avalon University School of Medicine in Clinical Skills. The aim of the study was to evaluate the hybrid model of clinical skills teaching. **Methods:** This is a quasi-experimental study where a control group with a sample size of 26 was compared with two study groups; one group included 24 participants, and as the other one consisting of 16 subjects selected without randomization. All students in the class were included in the study, except for those who withdrew voluntarily. The quantitative data were gathered in the form of a questionnaire on the Likert scale which was collected as the end of course evaluations. The quantitative data for the responses on the Likert scale was analyzed for descriptive statistics: Mean, Median, and Mode. The quantitative data also included the students' performance on assessments of clinical skills which was analyzed using ANOVA test. The qualitative data were gathered in the form of open-ended questions in the end of course evaluations. The qualitative data were also collected from the faculty members who were the examiners for the clinical skills course as the feedback taken from them. **Results:** There was a significant improvement in the feedback of students (end of course evaluations) after implementing the hybrid model of clinical skills teaching which was shown by increased Mean, Median, Mode for the most pointers on the Likert scale. Also, there was a notable improvement in the performance of students with a significant p-value ( $p < 0.05$ ) on ANOVA test. **Conclusion:** The hybrid model is very effective in teaching clinical skills. This teaching method can be evaluated by replicating this study at larger institutions with more number of students.

**Keywords:** Clinical skills, Teaching, Learning, Assessment, Feedback, Evaluation

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### Introduction

The major learning theories in the medical education are classified into behaviorism, constructivism, cognitive theory, socio-cultural theory, critical thinking, and humanism (1). In behavioral theory, students repeatedly practice the skills supported by the feedback and

reinforcement. Behavioral learning theory is the main underpinning learning theory for teaching clinical skills where students practice skills for several times until they master the skills and competencies. As per the behaviorist model of learning theory, learning happens through stimulus, feedback, and reward. The stimulus is

the input and learned behaviors are the output (2).

Even though there are many teaching methods of clinical skills, there is a need to find out the optimal method of clinical skills teaching to enhance the learning and training. The popular method of teaching clinical skills is Peyton's method (3) which is a four-stage model originating from a chapter focusing on teaching in operating theatres. This four-stage approach includes demonstration by the instructor, the demonstration by the instructor with commentary, the demonstration by the instructor but prompted by students, and students' demonstration with commentary.

The other famous instructional methodology for clinical skills is that of Robert Gagne which includes three stages: setting the stage, learning core activities, and summarizing and extending the learning process. These three stages are further divided into nine steps. Gaining learner attention, informing the learners of the objective, stimulating prior recall (previous knowledge) are the three steps in the first stage setting the stage. Presenting distinctive stimulus features (demonstrate), learning guidance for encoding of information (individualize), eliciting performance (practice), providing feedback are the four steps involved in the second stage of learning core activities. Assessing performance, and enhancing retention and transfer are the two steps involved in the third stage, summarizing and extending the learning process (4).

In Peyton's approach, there were lesser opportunities for discussion (constructive learning theory) and also fewer opportunities for repeated practice and receiving feedback. In Robert Gagne's method, there were lesser opportunities for the instructor to demonstrate. The rationale behind developing the hybrid model is that there should be more demonstration to the students and repeated practice by the students with opportunities of receiving feedback in the first two years of the medical program which provides the foundation for developing clinical skills. The underpinning idea behind the hybrid model is originated from the quote 'I hear and I forget, I see and I remember, I do and I understand', putting learning models into practice authored by Benjamin Horton (5). The hybrid model is implemented since the last two semesters: September- December 2017 (Fall 2017) and January- April 2018 (Winter 2018) semester.

Our clinical skills course curriculum in the basic sciences utilizes a standardized patient program (6). The objectives of clinical skills teaching and training include but are not limited to the acquisition of the clinical skills and

competencies required of students to enter the clinical rotations. Another objective includes developing clinical reasoning. The assessment of students in pre-clerkship clinical skills and clinical reasoning has the longitudinal impact on the students' performance in clerkships and graduate level medical education (7).

## Methods

This is a quasi-experimental study where the control group was summer 2017 class and study groups were fall 2017 and winter 2018 classes. Both study groups are compared with the control group. All students in the class were included in the study without any randomization. The participation of students in the study was voluntary, and the study objectives and conditions were clearly explained. Informed consent was taken from all students. Students filling the end of course evaluations was also voluntary.

The hybrid model was implemented for clinical skills taught in the second semester (MD2) for the period of fall 2017 and winter 2018 semesters. Kirkpatrick's model of evaluation (8, 9) was also used; level 1 and level 2 of Kirkpatrick's model.

At the end of the course, the student satisfaction questionnaire (survey form) was used to gather both quantitative and qualitative feedback. These included questions on a five-point Likert with the following responses available; one as dissatisfied (very poor), two as dissatisfied (poor), three as (neutral or no opinion), four as satisfied (good), and five as excellent (very satisfied). Some questions were included in determining if the students feel this is a worthy class or if they would recommend this class to other students. Students were also asked to comment on the strengths and weaknesses of the teaching and learning methods, using open-ended questions.

The survey instruments were administered on the survey monkey via email by the IT department of Avalon University, School of Medicine. The survey was performed anonymously and voluntarily. Once the IT department collected the responses, the results were analyzed by the investigators. The student satisfaction survey was administered at the end of the course after the grades were submitted.

The performance of students on summative assessments was compared across the semesters. Students receive two summative assessments in each semester, and their final grade is the average of both assessments. The performance of students with the Hybrid Model was compared with that with conventional teaching method. Not only the numbers or grades of students were compared,

but also we gathered the feedback from the examiners who assessed the students in clinical skills course.

The data were analyzed using SPSS Statistics analyzer. Student feedback on the end of course evaluations was analyzed using descriptive statistics, Mean, Median, and Mode. The class performance (average or mean class performance) of different groups (semesters) was analyzed using ANOVA test. P-value less than 0.05 was considered as significant.

The hybrid model has eight steps. The eight steps include explaining the learning objectives, prior recall or discussions based on the knowledge of biomedical sciences, demonstration with commentary and audiovisual aids/PowerPoint, demonstration with commentary but no PowerPoint, practice by students in groups and feedback is provided while students are practicing, students demonstrate in front of the instructor, assessment, and feedback.

#### *Students demonstrate in front of the instructor*

Once the students practice the clinical skills for two to three times, learners were asked to demonstrate the skills in front of the instructor. This offered another opportunity to the instructor to provide constructive and effective feedback on time. The feedback provided was focused rather than generalized or vague (10).

#### *Assessment*

Assessment was conducted at the end of the module, and standardized patient-based (SP-based) assessment method was used. SP-based assessment's validity was conferred by Miller's learning pyramid (11) which correlate with the level the "student shows." The validity of assessments was further strengthened by the content of the station, learning objectives of the module, and blueprinting. Currently, we are using rubrics for these assessments and rubrics are rated based on three domains: knowledge, attitudes (behaviors), and skills (both communication and clinical skills). The professional behaviors are assessed based on professional attitudes towards faculty members, standardized patients, and

peers, attendance for all sessions, and active participation in group activities or in-class activities which were included as part of the final grade. The final grade also carried 10% from involvement in community services.

#### *Feedback*

Feedback was also provided to the students after the final or summative assessment which could be helpful to change the behaviors of learners for future practices. After implementing the hybrid model of teaching methods in clinical skills, we evaluated this teaching method by the Kirkpatrick's evaluation. Levels 1 and 2 of Kirkpatrick's model were evaluated. The students' reaction was measured in the form of end of the course evaluations (feedback) and students' leaning was measured by assessments in the clinical skills course.

### **Results**

#### *The reaction of students (survey form) - Kirkpatrick level 1*

The results of the end of the course evaluations were analyzed. Student feedback was anonymous, and students participated in the survey voluntarily. The ratings by students were measured on the Likert scale of one to five. One is very dissatisfied (very poor), two is dissatisfied (poor), three is (neutral or no opinion), four is satisfied (good) and, five is very satisfied (excellent).

The end of course evaluations was taken in summer 2017 semester when a conventional method of teaching clinical skills was used and also during fall 2017 and winter 2018 semesters when the hybrid model was implemented. During summer 2017 semester there were 26 students, and all 26 students filled out the feedback form (100% response rate). During fall 2017 semester there were 24 students, and 22 students filled out the feedback form (91.66% response rate). During winter 2018 semester there were 16 students, and 14 students filled out the survey form (87.5% response rate) (Table 1).

The course evaluations were analyzed using median, mode, and mean. There was a drastic improvement from summer 2017 semester to fall

**Table 1:** The demographic characteristics of the participants

Cohort	Total #	Biologic Sex		Race or Ethnicity			
		Female	Male	Caucasian	Hispanic	African	Asian
Summer 2017 control	26	13	13	2	0	3	21
Fall 2017 Study group	24	10	14	2	0	2	20
Winter 2018 Study group	16	3	13	2	0	4	10

2017 and winter 2018 semesters when the hybrid model was implemented (Tables 2 and 3).

#### Learning –assessments- Kirkpatrick level-2

The class average or performance of students was compared between summer 2017, fall 2017, and winter 2018 semesters. There was an improvement in the performance of students (Table 4). The incomplete grades of the students who had withdrawn voluntarily from the course were not included in the analysis. One student withdrew from Summer 2017 group and also one from Fall 2017 group and N was adjusted accordingly as these students did not receive the final grade.

The ANOVA showed that  $F_{calc} > F_{crit}$  which shows that there is a significant difference in mean values or class average performance, and students' performance improved with hybrid model compared with the conventional method of teaching. The p-value calculated was 0.008

which is significant ( $p < 0.05$ ).

#### Qualitative analysis

Apart from quantitative numbers like median, mode, and mean, we analyzed the comments that were obtained in fall 2017 semester and winter 2018 semester. The qualitative questions were included in the end of course evaluations in the form of open-ended questions. The open-ended questions included the themes including strengths of the teaching methods, weaknesses of the teaching methods, if they recommend this course to other students, and if there are any improvements required in the course. Here are some of the strengths mentioned in their own words.

#### Strengths of the teaching methods

*“The instructor did an amazing job of teaching Clinical Skills. He is extremely knowledgeable about actual medical practices. I appreciated*

**Table 2:** Median and Mode of students' feedback on the end of course evaluations

Item	Summer 2017 Conventional Teaching Method (control group) N=26		Fall 2017 Hybrid model of teaching (study group) N=22		Winter 2018 Hybrid Model of Teaching (study group) N=14	
	Med	Mode	Med	Mode	Med	Mode
	The Instructor stimulated student's interest in the subject	4	4 & 5	5	5	5
The instructor managed classroom time and pace well	4	4	5	5	5	5
The instructor was organized and prepared for every class	4	4	5	5	5	5
The instructor encouraged discussions and responded to questions	4	4	5	5	5	5
The instructor demonstrated in-depth knowledge of the subject	4	4	5	5	5	5
The instructor appeared enthusiastic and interested	4	4	5	5	5	5
The instructor used a variety of instructional methods to reach the course objectives e.g., group discussions, audiovisual aids, & Standardized Patient program, etc.	4	4	5	5	5	5
Please rate the overall quality of the Class/ Instructor	4	5	5	5	5	5
Information about the assessment was communicated clearly	4	5	5	5	5	5
Feedback was provided within the stated time frame. (Providing the rationale)	4	4 & 5	5	5	5	5
Feedback showed how to improve my work	4	4	5	5	5	5
The course objectives were clear	4	5	5	5	5	5
The course procedures and assignments support course objectives	4	4	5	5	5	5
The instructor gave guidance on where to find resources	4	5	5	5	5	5
Overall, how student's experience in this course	3	3	5	5	5	5
Student contributed constructively to in-class activities.	4	4	5	5	4	4
Student's perception of achieving course learning objectives	4	4	5	5	5	5



**Table 3:** Mean values of the students' feedback on course evaluations

Item	Mean±SD N=26 Control group Summer 2017	Mean±SD N=22 Study Group Fall 2017	p	Mean±SD N=14 Study Group Winter 2018	p
The Instructor stimulated student's interest in the subject	4.00±1.1	4.80±0.40	0.001	4.799±0.56	0.004
The instructor managed classroom time and pace well	4.15±1.03	4.75±0.43	0.009	4.79±0.56	0.015
The instructor was organized and prepared for every class	4.08±1.00	4.75±0.43	0.003	4.71±0.59	0.016
The instructor encouraged discussions and responded to questions	4.08±0.83	4.68±0.46	0.002	4.71±0.59	0.008
The instructor demonstrated in-depth knowledge of the subject	4.31±0.46	4.79±0.41	<0.001	4.69±0.61	0.048
The instructor appeared enthusiastic and interested	4.15±0.66	4.58±0.59	0.021	4.64±0.61	0.023
The instructor used a variety of instructional methods to reach the course objectives (e.g., group discussions, audiovisual aids, & Standardized Patient program, etc.)-	4.23±0.58	4.74±0.44	0.001	4.57±0.62	0.098
Please rate the overall quality of the Class/ Instructor	4±1.18	4.58±0.67	0.038	4.79±0.56	0.006
Information about the assessment was communicated clearly	3.92±1.14	4.63±0.48	0.005	4.64±0.61	0.013
Feedback was provided within the stated time frame. (Providing the rationale)	3.69±1.20	4.63±0.48	<0.001	4.71±0.59	<0.001
Feedback showed how to improve my work	3.46±1.34	4.47±0.68	0.001	4.57±0.62	<0.001
The course objectives were clear	3.77±1.37	4.68±0.46	0.002	4.64±0.61	0.008
The course procedures and assignments support course objectives	3.92±1.33	4.63±0.48	0.014	4.71±0.59	0.013
The instructor gave guidance on where to find resources.	4.15±0.77	4.63±0.48	0.011	4.64±0.61	0.033
Overall, how student's experience in this course	3.62±1.15	4.74±0.64	<0.001	4.79±0.56	<0.001
Student contributed constructively to in-class activities.	4.23±0.70	4.68±0.46	0.010	4.36±0.61	0.545
Student's perception of achieving course learning objectives	4±0.88	4.68±0.57	0.002	4.50±0.63	0.044

**Table 4:** Class average – Learning Measurement

Semester	Total students	Class average	±Standard Deviation	Range
Summer 2017 Control group	N=25	81.04%	±8.43	70-100
Fall 2017 New Teaching Method (study group)	N=23	93.13%	±6.73	71-100
Winter 2018 New Teaching Method (study group)	N=16	93.18%	±4.35	87-100

*his desire to teach us, but most importantly the high expectations he had for the class and each of us individually”.*

*“The knowledge of the instructor brought his clinical experience to his teaching which made it more relatable and easier to learn the material.”*

*“Instructor is a qualified physician who brings a vast amount of knowledge to every lecture he teaches. His ability to connect the theoretical knowledge with the clinical practices is impressive. The instructor's teaching is very interesting”.*

*Weaknesses of the teaching methods and if there are any improvements required in the course.*

Students reported no weaknesses on this course after implementing the hybrid model of teaching. Students recommended no improvements in this course.

*Is it a worthwhile class and do they recommend this course to other students?*

100% of students reported this course was a worthwhile course, and they recommended this course to other students. The new teaching method was evaluated to see if there are any changes in the behaviors or attitudes of the learners towards the learning process and if these behaviors are used in practice. The professional behaviors are part of the final grade which is based on professional

attitudes towards faculty members, standardized patients, and peers, attendance for all sessions, and active participation in group activities or in-class activities.

We used examiners from our university to assess the students along with the course director of the clinical skills. We had one examiner from a different department who was also a physician and one examiner from the clinical skills department who was not involved in the teaching of the same modules on which students were assessed. The same examiners were used for summer 2017, fall 2017, and winter 2018 semesters. Here is the critique of the examiners in their own words from the last semester, winter 2018.

Examiner 1

*"Few students were excellent. Students demonstrated the professional and respectful behavior. The majority of the students performed a very organized physical examination. They were able to explain the general purpose of interaction and the procedures to be used. Few students need improvement in communication skills".*

Examiner 2

*"Overall, the students improved a lot; they did an amazing physical exam. Few of them need improvement in communication skills, but in general they did a great job".*

## Discussion

The new teaching method, hybrid model, has shown improved results. The feedback from the students is improved after implementing the new teaching method. Learner's satisfaction is improved distinctly. Students' feedback regarding the instructor stimulated the student's interest in the subject, the instructor encouraged discussions and answered the questions, the instructor was organized and prepared for every class and managed classroom time and pace, and overall quality and experience of the course improved considerably with a highly significant p-value.

Students' feedback regarding assessments and feedback, if feedback is given in the stated time frame and if feedback improved their work also improved. Students felt that they were very clear with course objectives and their assignments supported the course learning objectives. This is evidenced by a highly significant p-value. Students also felt that they were contributing towards the in-class activities and they were very satisfied that they were achieving the course learning objectives.

Students' feedback form (end of course evaluations) had 17 questions, as mentioned in Table 1. Apart from these 17 questions which are

rated on the Likert scale of one to five, there are other questions which are yes or no questions. These questions include if the students feel that the clinical skills course is worthwhile and if students recommend this course to other students. The response from the students is very significant for these two questions, and 100% of students said yes.

Students' performance in assessments also improved considerably. The attitudes of learners towards the learning process improved and, they practiced professional behaviors.

## *Learning theories involved in teaching clinical skills*

We analyzed the learning theories underpinning this teaching model. Following learning theories underpin this hybrid model of teaching. The primary learning theories involved in teaching clinical skills are behaviorism, constructivism, and active learning theory (in-class activities). The minor learning theories involved in teaching clinical skills are the socio-cultural theory, cognitivism, and reflective learning.

Behaviorism is the learning theory based on changing the behaviors and or competencies of the learner by practicing skills repeatedly. The repetition is used to help the learners until the desired response is achieved (1). The repetition and practice in groups is the significant difference between conventional methods of teaching and hybrid model of teaching. In clinical skills course, students practice physical examination skills and communication skills till the desired response is attained. Behavioral learning theory is the basis for teaching clinical skills.

In constructive learning theory, the learner analyzes the information which is already known and develops the new information (12). Previous experiences of the learner and previous understandings of the learner play a key role in the learner's construction of new understanding (13). This is achieved in this hybrid model through discussions at the stage "prior recall or discussions based on the knowledge of biomedical sciences." Communication and continuous discussion among the learners help to make a comparison with the peers which are achieved at the stage "practice by students in groups and feedback is provided while students are practicing."

*Active learning theory (in-class activities):* learners are actively involved in the class and participate in group discussions and group practice. The learner's feedback on this item "Student contributed constructively during in-class activities" has shown improvement after implementing the hybrid model of teaching.

*Experiential learning and idea of reflective learning:* Even though reflective learning is not a learning theory, it is an important idea which plays a role in learning and training clinical skills. Students do practice skills and have their own experiences. Students will be asked to assess themselves and reflect on their own experiences (14). Feedback is also provided while students are practicing. Based on their experiences and feedback, students develop new knowledge and experiences.

*Socio-cultural theory:* In socio-cultural theory, learning is essentially a social and cultural process. Learning occurs in the workplace through experiential learning or community-based learning. The first step involved in community-based education is to identify the health issues or common ailments which are more prevalent in that particular community. Service activities that address a community-identified need are planned. We identified obesity/overweight, hypertension and diabetes as pressing health issues in Curacao (15).

Community services are part of the clinical skills course. Community-based education is an educational program carried out in the community outside the hospital (16). The classroom activities are connected with the community activities. Students are trained on measuring the blood pressure, body mass index, and blood glucose. These activities help the students to develop the communication skills and leadership qualities. When students are making visits to the communities, they not only are screening the communities for common diseases, but also are required to understand the social issues affecting the health and illness. The ideal community-based education should benefit both the community and students (15).

## Conclusion

Further evaluation is required by looking at the performance of students when they enter the clinical program. We will seek the feedback from our clinical preceptors if there is any improvement in clinical skills when they are progressed to clinical rotations. Examiners also commented that there was an improvement required in communication skills of the students. We are planning to implement more practice sessions or opportunities for students in communication skills to improve their skills in this area. This teaching method can be evaluated by replicating it at larger institutions with larger sample size.

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## Key Practice Points

The integration of clinical skills with the basic sciences is critical.

Repeated practice of skills with feedback and reinforcement is the key to the success of teaching clinical skills.

In-class activities play a major role in teaching clinical skills rather than just lecture sessions.

**Conflict of Interest:** None declared.

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