COMPARISON OF EMPATHY LEVELS OF DENTISTRY STUDENTS AFTER TWO TEACHING STRATEGIES OF ADMINISTERING LOCAL ANESTHESIA

[1]Celian N. Teng, (DMD, MHPEd), [2]Erlyn A. Sana, (PhD),
[3]Maria Geraldine S. Chanco, (DMD, MHPEd)

University of the East

Manila, Philippines

Abstract: **This research compared the student-to-student (STS) model of injection as a default teaching strategy for dentistry students and the non-classmate-as-patient model of injection in helping dental students acquire or increase their level of empathy. This study used the quasi-experimental research design. Levels of empathy of second year dental students from a private tertiary institution were determined before and after any injection activities were performed using the Jefferson Scale of Empathy-Health Professions Students (JSE-HPS) version. One group administered the injections using the STS model of injection and another group performed the injections on their friends and family members. Pre-test and post-test scores of both groups were collected. Mean, frequency and percentage distributions, and t-test for both paired and unpaired groups were used to analyze data. Data showed that the pre-test level of empathy of second-year dental students ranged from 82 to 132 with a mean score of 107.46 (SD=10). Their post-test empathy level ranged from 82 to 134 with mean equal to 112.46 and SD=12.45. T-test yielded -3.76 at p=0.00 providing evidence that the two strategies improved the empathy level of students. Results affirm that while the overall level of empathy increased after using both strategies, only those who injected the local anesthesia to non-classmates registered a significant increase; there was no significant change for the STS group**.

Keywords: **Student-to-student model of injection, empathy, local anesthesia in dentistry, JSE-HPS.**

I. INTRODUCTION

All practicing dentists must demonstrate appropriate behavior of professionalism. One of the attributes for professionalism is empathy. Empathy is putting the patient's interest first, respect for patient's dignity and choices and communicating effectively [1]. Hojat defined it as "a cognitive attribute that involves an understanding of the inner experiences and perspectives of the patient, combined with a capability to communicate this understanding to the patient [2]. Empathy according to Yarascavitch is both an emotional and cognitive process, a person's drive to contain his/her own emotions and thoughts to feel and imagine being in another person's shoes [3].

Dental anesthesiology is a preclinical subject required for second year dental students before they can proceed with their clinical subjects and requirements the following year. It is important that dental students' empathy is developed steadily during this time before they become full-pledged clinicians. Empathy levels of dental students usually start to drop during the second year of dental training, and this is the same time and year that students start to treat patients [4].

There are various methods of teaching local anesthesia administration such as the use of video and actual demonstration, practice on cadavers, use of simulation models, and practice on human subjects [5] The student-to-student model is the most common practice used in majority of the dental schools globally [6]. STS entails a practice of reciprocal local anesthesia injection among preclinical students with their respective classmate partners.

Students who have not done any practice injection on models or cadavers are more likely to commit mistakes during the actual injection. These mistakes may cause complications, either during or after the injection. Students, therefore, should be very careful and empathetic towards their fellow students/patients especially when they do not have prior training on a model. When students assume the role of being a patient and receive the "treatment" themselves, they will have a first-hand experience and appreciate what the patient feels and experience during local anesthetic injection [7].

When these preclinical dental students do actual clinical practice in the following year and beyond, they should use their empathy skills in treating their patients. Applying the experiential learning theory of Kolb, these students who had undergone student-to-student model of injection, can apply their experiences from the STS model of injection to form their knowledge. The actual STS model of injection is the concrete experience, which they will use as basis for their observations and reflections. From these reflections, they can create their abstract concepts and bases for their next actions.

In this study, the STS group was compared to another group of students who used "real" patients (non-classmates) to check if empathy was develop or increased through their interactions with their patients and the feedback they received.
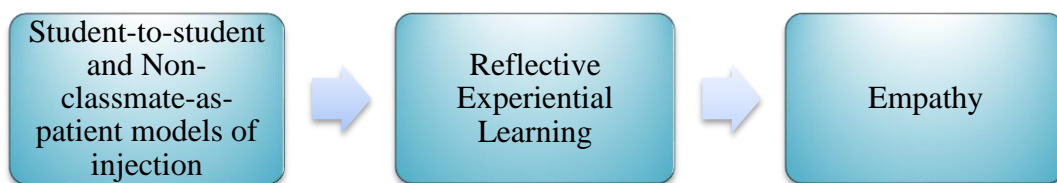

Figure 1. Conceptual Framework

II. METHODOLOGY

This study used a quasi-experimental research design. The population was recruited from two sections of second-year dental proper students of a private tertiary institution in the Philippine National Capital Region. A total of 74 second-year dental students composed the population of this study. Participants in the study were selected using purposive sampling. All second-year dental students of the selected dental school taking dental anesthesiology under the class of the researcher for the 1st semester of AY 2019-2020 served as accessible population and were requested to join the study.

Students in one section (n1=39) performed practice injection using the student-to-student model in their dental anesthesia class; those in the other section (n2=35) utilized the non-classmate-as-patient model of injection. In the latter section, students did not act as "patients" during the local anesthesia injection and therefore did not receive an injection from their classmates. All students from both sections who gave their agreement and informed consent served as respondents. Ages of the population range from 18-34 years old, with an average of 20 years old. There are more females than males. Majority of the students are Filipinos, with less than 5% classified as foreign students, consisting of Iranian, Chinese, and African. Both groups of students were requested to accomplish the JSE-HPS instrument before and after the injection exercise.

The study used the Jefferson Scale of Empathy-Health Profession Students version (JSE-HPS) to measure the level of empathy. It had 20 items, Likert-type with a seven-point scale (1 =" strongly disagree," 7 = "strongly agree") [8]. Total score ranged from 20 to 140. The higher the score, the higher the degree of empathy noted [9].

The JSE-HPS involved three constructs namely, (1) perspective taking, (2) compassionate care, and (3) standing in the patient's shoes. Perspective taking, the core cognitive ingredient of empathy, is the physician's view of the patient's perspective. It had ten positively worded items. These were items numbered 2, 4, 5, 9, 10, 13, 15, 16, 17 and 20 [10], [11]. Compassionate care is understanding a patient's experiences or emotions in patient care and had eight negatively worded items but reverse scored [8]. These were items numbered 1, 7, 8, 11, 12, 14, 18 and 19. Standing in patient's shoes is thinking like the patient. It had two negatively worded and reversed-scored items [8]. These were items numbered 3 and 6.

The JSE-HPS was administered as a pre-test to both groups of respondents at the start of or within the first two weeks of the semester of the Dental Anesthesiology class to determine the baseline level of the dental students' empathy. The JSE-HPS was submitted at the start of the class and before any dental anesthesia injection techniques were taught in the class. During the succeeding class sessions of both groups, the researcher consciously modelled the correct attitudes towards the patients, solicited and provided feedback, and engaged the students in active discussions to develop not just professionalism but also empathy, diligence, and compassion.

During the final period of the semester, after the local anesthesia injection activities were completed, the same JSE-HPS was again administered as a post-test to all respondents. They were given time to answer and submit the accomplished scale before the end of the semester. The pre-test was administered on July 10, 2019, and the post-test was completed on October 19, 2019.

III.   RESULTS

There was a total of 77 respondents who originally gave their consent and agreed to participate in the study. Three were dropped out of the study because they did not answer the post-test JSE-HPS scale. Final participants left in the study totalled 74. There were 63 female (85.13%) and only 11 male (14.86%) second-year dental students that participated in the study. The age of the respondents ranged from 18 to 34 years old. The male respondents' age ranged from 20 to 23 while the female respondents age had a wider range, from 18 to 34 years old. The median age for male students was 21 (with standard deviation [SD]=1.10); that of female students was 21 years old (SD=2.66).

The STS Model group had 39 (n1=39) participants; 34 (87%) were females and 5 (12.82%) were males. The mean age for males and females were 21 years old (SD=1.22) and 21.24 years (SD 2.95) respectively. Figure 2 shows the distribution according to age and gender of the STS group.
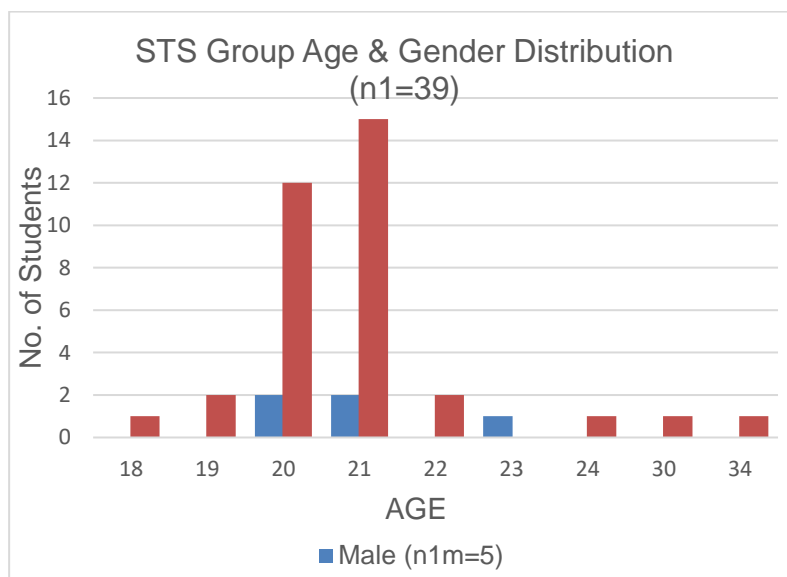

Figure 2. STS Group age and gender distribution

For the Non-classmate group, total number of students was 35 (n2=35); there were more females, 29 (82.85%), than males, 6 (17.14%). The mean age for the male was 21.5 years old (SD=1.05) and mean age of female was 21.21 years (SD 2.32). Figure 3 below shows the distribution according to age and gender of the control group.
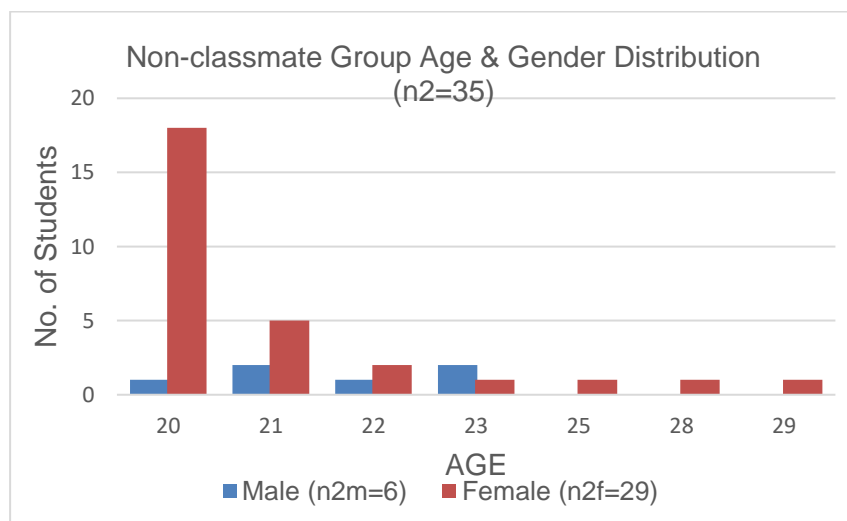

Figure 3. Non-classmate Group age and gender distribution

A. Empathy Profile of Respondents

Table 1 shows the descriptive statistics of the pre-test JSE-HPS scores of all students. Overall pre-test scores ranged from 84, as the lowest, and 132, as the highest, with a mean of 107.46 (SD=10). The same table shows the descriptive statistics of post-test scores of all students, after they have administered a local injection to a patient (STS or non-classmate model). Their scores ranged from 82 to 134. Mean post-test score of all students was 112.46 (SD=12.45). There was an increase from pre-test to post-test mean scores of the second-year dental students who participated this research. T-Stat score was -3.76 and P value was 0.00.

Table 1. Descriptive Statistics & t-Test of Pre-test & Post-post JSE-HPS Scores of All Students (N=74)

Descriptive Statistics & t-Test	Pre-test	Post-test
Mean	107.46	112.46
Mode	109.00	117
Median	108.00	114.5
Standard Deviation	10.00	12.45
Possible range	20-140	20-140
Actual range	84-132	82-134
t-Stat	-3.76	
P value	0.00	

B. Pre-test and Post-test JSE-HPS Scores of the STS Group

Majority of the students in the STS group had an increase in their pre-test to post-test JSE-HPS scores. The biggest increment in their score was by 34 points. Although 62% of the students had an increase in their post-test scores, 38% had a decline in their post test scores, one student dropped as much as 26 points. The pre-test scores ranged from 91 to 132 with a mean of 107.95 (SD=10.43); the post-test score range was 84 to 134 with a mean of 111.33 (SD=14.59). There was a 3.38-point increase in the overall mean from pre-test to post-test JSE-HPS scores of students from the STS group but the effect was not significant with a P value of 0.07 and t-Stat of -1.84, as shown below in Table 2.

Table 2. Descriptive Statistics & t-test of STS Group

Descriptive Statistics & t-Stat of STS Group (n1=39)	Pre-test	Post-test
Mean	107.95	111.33
Mode	109.00	97.00
Median	109.00	113.00
Standard Deviation	10.43	14.59
Possible range	20-140	20-140
Actual range	91-132	84-134
t-Stat	-1.84	
P value	0.07	

C. Pre-test and Post-test JSE-HPS Scores of the Non-classmate Model Group

The non-classmate model group students recruited "patients" other than their classmates. These included their friends, other school mates, and family members. There were 25 out of 35 students (71.43%) who scored higher in their post-test compared to their pre-test JSE-HPS scores, while 8 (22.86%) students had a lower post-test scores compared to their pre-test scores. There were 2 (5.71%) students who had no change in their pre-test and post-test JSE-HPS scores. The increase from pre & post-test scores ranged from as little as 2 points to as high as 30 points. The range in the decline of the pre-test to post-test scores was from 2 to 27 points.

The mean pre-test JSE-HPS score of the non-classmate group was 106.91 (SD=9.62). The mean post-test JSE-HPS score was 113.71 (SD=9.59). Students in the non-classmate group had a 6.8 point increase in their pre-test to post-test mean JSE-HPS scores. This increase from pre-test to post-test JSE-HPS scores of the students in the non-classmate group was significant with a P value of 0.00. Descriptive statistics and t-test are shown below in Table 3.

Table 3. Descriptive Statistics & t-Test of Non-classmate Group

Descriptive Statistics & t-Test of Non-classmate Group (n2=35)		
	Pre-test	Post-test
Mean	106.91	113.71
Mode	102.00	117.00
Median	107.00	115.00
Standard Deviation	9.62	9.59
Possible range	20 - 140	20 - 140
Actual range	84 - 121	82 - 134
t-Stat	-3.58	
P value	0.00	

D. Comparison between Pre-test JSE-HPS Scores of the STS Group and Non-classmate Group

The mean pre-test score for the STS group was 107.95 (SD=10.43), while for the non-classmate group, it was 106.91 (SD=9.62). T-test of the pre-test scores of both groups was done. P value of 0.658 proved that there was no significant difference in the cognitive and socio-behavioral traits of the control and STS group confirming that the two groups were indeed matched.

E. Comparison between Post-test JSE-HPS Scores of STS and Non-classmate Group

The mean post-test score of the non-classmate group (113.71, SD=9.59) was higher than that of the STS group (111.33, SD=14.59), which was opposite of the pre-test mean score. The range of scores of the STS and non-classmate goups were 84 to 134 and 82 to 134 respectively. P value of their post-test scores was 0.41, again showing that there was no difference between the two groups.

F. Comparison of the level of empathy of STS and Non-classmate Groups based on post tests

There was a higher increase from the pre to post-test mean scores of the students in the non-classmate group as compared to that of the STS group as shown in Figure 4. For the non-classmate group, the increase was 6.8 points as compared to the STS group of 3.38 points in their mean scores. The difference is also seen in their P value, 0.07 for the STS group and 0.00 for the non-classmate group.
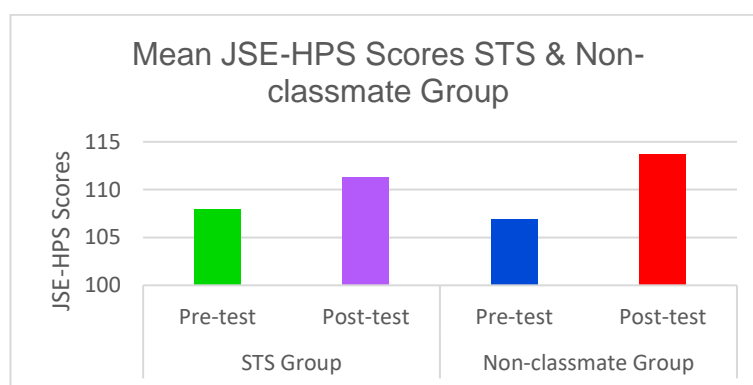
Figure 4. Comparison of Pre & Post-test Scores of STS and Non-classmate Group

G. Comparison of Pre-test Scores & Post-test JSE-HPS Scores

The STS group had a higher pre-test mean JSE-HPS score (107.95) compared to the non-classmate group (106.91). But the post-test scores were the opposite, the non-classmate group had the higher mean JSE-HPS score of 113.71 compared to the STS group's post-test JSE-HPS score of 111.33 as shown in Figure 4.5.
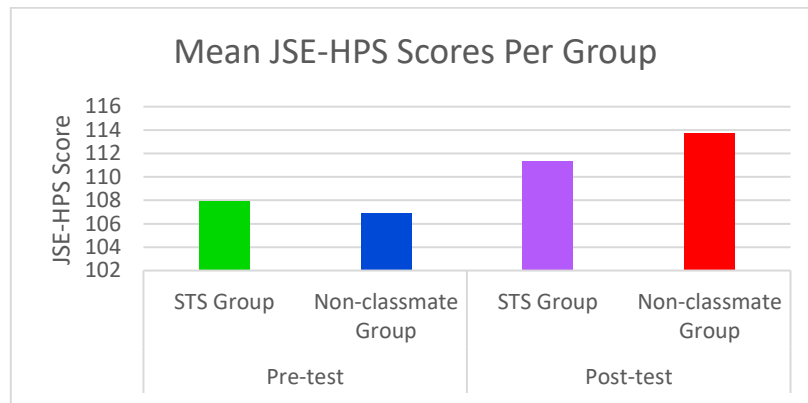
Figure 5. Comparison of Pre-test & Post-test JSE-HPS Scores

IV. DISCUSSION

The baseline level of empathy of the second-year dental students was reflected by their pre-test JSE-HPS scores. This test was taken before any local anesthesia administration was performed by the students. Their scores ranged from 84 to 132 out of the highest possible score of 140. Their mean score was 107.46 with a standard deviation of 10. Hojat in his study chose two points on the score distribution to determine the cut-off scores for entering medical students. This is to know the high and low scorers in the JSE. These points are one and half standard deviation above and below the mean scores. Those who were above are the high scorers and those who scored below are the low scorers [8]. Following the same formula, majority of the second-year dental students scored within the cut-off scores. Four students scored above 122 and were considered high scorers. Only 3 students scored lower than 92 and were considered low scorers. They represent 5.4% of the top scorers and 4.05% bottom scorers in the total population score distributions.

The mean empathy score of 107.46 of the second-year dental students in this study was comparable to the mean empathy scores of dental students from other countries and with other health profession students.

The result of the pre-test and post-test empathy scores of the students in the STS group showed an increase in their empathy level, but the test of comparison done indicated that the change was not significant. The unremarkable increase may be due to already high pre-test scores; the small increase during the post-test was not enough to make a significance. Another possible reason for the insignificant increase was that some students had a decrease in their empathy scores.

Students who had a decrease in their scores was consistent with the study done by Chen that dental students' empathy scores decreased after patient care responsibilities began [12]. The decrease may also be due to the stress the dental students felt while studying, practicing, and performing the injection techniques before and during the local anesthesia administration. Similar studies with medical students found that stress from long-work hours and sleep deprivation contributed to the decrease in students' empathy [12].

Although there were some students who scored lower in their post-test, majority of them had an increase in their empathy scores. This was in contrast to a study done with health profession students, which included dentistry students, which shows that empathy declines in their first year of training [13]. The increase in the average empathy scores of all students, both in the STS group and the non-classmate group, was reflected in items that garnered the highest score in the JSE-HPS, vis-à-vis, "Patients feel better when their health care providers understand their feelings" (pre-test) and "I believe that empathy is an important factor in patients' treatment" (post-test). Their experience of being a patient made them reflect, transform the experience, and create a new knowledge, empathy, as explained by Kolb in his experiential learning theory. This new knowledge was shown in the increase in their level of empathy. This was also proven in an increase in the average score from pre-test to post-test of all items in the JSE-HPS, except for two items. "Attention to patients' emotions is not important in patient interview" and "Health care providers should not allow themselves to be influenced by strong personal bonds between their patients and their family members" showed a slight decrease in the students' post-test scores.

The result of the pre-test scores of the STS and non-classmate group had no significant difference. The post-test scores of the non-classmate group, on the other hand, had a significant increase in the empathy level of the students. The increase may be attributed to the new learning formed similar to Cox's clinical learning cycle. In this cycle, the students learned the theoretical concepts in the classroom, laboratory sessions and demonstrations, and the actual local anesthesia administration to a patient that taught them to care for their patients along with the skills needed in the different injection techniques. The

average pre-test scores of the non-classmate group was lower compared to that of the STS group; however, the average increase in score (in the post-test) of the former was higher than that of the latter. This created a higher rise in post-test scores and made it significant.

The results affirmed that while the overall level of empathy increased after the two strategies, those who injected the local anesthesia to actual patients like members of their family and friends outside the class registered a significant increase compared to the STS. Peers in the STS coached each other and served more as peers than as patients, while the non-classmate group had real patients who showed real facial expressions and reactions.

V. CONCLUSION

In conclusion, the level of empathy of second-year dental students in this study was comparable to the level of empathy of other health profession students.

Post-test empathy scores in the majority of the students in the STS group reflected a rise, albeit insignificant. The increase is assumed to be due to their STS model of injection experience, which transformed their reflections and resulted in their acquisition of learning, the concern for their patients' feelings and developing and/or increasing their empathy levels. The decrease in the post-test scores of some students may be attributed to the stress before and during the local anesthesia administration. The STS model of injection, as a peer simulation, helped in the development of empathy.

The non-classmate group, on the other hand, had a significant change in their overall empathy levels. This showed that students improved their level of empathy when they dealt with real "patients" such as their friends and family, instead of their peers who would have served more as coaches during the STS experience.

Both models of injections increased second-year dental students' level of empathy.

REFERENCES

[1] Beattie, A., Durham J., Harvey, J., Steele, J., & McHanwell, S. Does Empathy change in first-year dental students? European Journal of Dental Education. 2012; 16e111-e116.

[2] Hojat, M., Mangione, S., Nasca, T.J. Rattner, S., Erdmann, J., Gonnella, J., Magee, M. An empirical study of decline in empathy in medical school. Medical Education. 2004; Vol. 38, 934-941.

[3] Yarascavitch, C., Regehr, G., Hodges, B., Haas, D. Changes in Dental Student Empathy During Training. Journal of Dental Education. 2009; Vol. 73, No. 4, 509-517.

[4] Sherman, J. J., & Cramer, A. Measurement of Changes in Empathy During Dental School. Journal of Dental Education. 2005; Vol. 69, No. 3, 338-345.

[5] Brand, H.S., Baart, J.A., Maas, N.E., Bachet, I. Effect of a Training Model in Local Anesthesia Teaching. Journal of Dental Education. 2010; Vol. 74, No.8.

[6] Brand, H.S., Kuin, D., Baart, J.A. European Journal of Dental Education. 2008; 12, 85-88.

[7] Hossaini, M. Teaching Local Anesthesia in Dental Schools: Opinions About the Student-to-Student Administration Model. Journal of Dental Education. 2011; Vol. 75, No. 9.

[8] Hojat, M.. Empathy in Health Professions Education and Patient Care. Switzerland. Springer International Publishing. 2016.

[9] Leombruni, P., Di Lillo, M., Miniotti, M., Picardi, A., et al. Measurement Properties and confirmatory factor analysis of the Jefferson Scale of Empathy in Italian medical Students. Perspect Med Educ. 2014; 3:419-430.

[10] Davis, M.H., Luce, C., Kraus, S.J. (1994). The Heritability of Characteristics Associated with Dispositional Empathy. Journal of Personality. Vol. 62, Issue 3.

[11] Spiro, H. M., Cumen, M., Peschel, E., James, D. (1993). Empathy and the practice of medicine: Beyond pills and the scalpel. Yale University Press.

[12] Chen, D., Lew, R., Hershman, W., Orlander, J. A cross-sectional measurement of medical student empathy. Journal of General Internal Medicine. 2007; 22.1434-1438.

[13] Nunes, P., Williams, S., Sa, B., Stevenson, K. A Study of empathy decline in students from five health disciplines during their first year of trainixng. International Journal of Medical Education. 2011; 2, 12-17.