



Medical student's perception to different types of set induction in anatomy lectures

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Abstract: Set induction refers to the process of using a thought-provoking statement, interesting fact, or an audio-visual stimulus at the beginning of lecture to gain student's attention and give an overview about the lecture topic. In the present study, students were introduced to three types of set induction namely narratives, food-based analogies and humor-based images or activities at the beginning of anatomy lecture and their response to it is collected and analyzed. The objective of the study is to estimate the difference in a questionnaire-based perception score between the three different types of set induction; estimate sex differences in the questionnaire-based perception score. Students rated the validated, 7-item perception questionnaire using a 5-point Likert scale. Students felt that food-based analogies and humor-based images were more interesting, motivated them to participate in lecture-discussion than the narrative set induction. The familiarity of set induction varied between all the three different types of set induction. There was no significant difference in the perception of different types of set induction between male and female undergraduate students. Based on the student's feedback, it could also serve as a memory aid and ease the students learning experience. Majority of students responded positively to the use of set induction and recommended for its use in future classes.

Key words: Analogies, Food, Humor, Set induction


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Introduction

A set is a cognitive process activated by a stimulus or a stimulus perceived by a person in an environmental situation. Set induction refers to the initial instructional act by the teacher for the purpose of establishing a frame of reference between the experiential field of the pupil and the desired behavioral objectives of the learning experience [1]. In teaching context, set induction is often used at the beginning of a lecture for gaining attention, increasing motivation, under-

standing prior learning, providing an overview of content that follows or determining the expectation of the participants [2]. Gagne's model of instructional design is based on the information processing model of the mental events that occur when adults are presented with various stimuli and how to arrange those specific instructional events to achieve learning outcomes. Among the nine specific instructional events, gaining student attention is the first step in enhancing the learning process [3]. Schuck et al. [4] have investigated the use of set induction and its effect on student knowledge retention. The results of his study concluded that the students taught by teachers trained to use set inductions had greater achievement than those taught by teachers who did not receive any training in set induction [4]. The common mode of gaining the learners attention in medical lectures are clinical case scenarios, open-ended problems and audio-visual stimulus [5]. But in anatomical education, the use of set induction and how

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the students perceive those are not discussed.

Student engagement refers to a broad range of activities which enhance learning and professional development in students [6]. Many factors like interest, sense of purpose, academic integration, emotional connect and self-efficacy have been linked to student engagement [6, 7]. Since student engagement leads to higher level thinking and better learning outcomes [8], it is vital to understand what engages the new generation of learners. Motivation refers to the state of mental readiness for learning [9, 10]. Previous studies have focused on reward mechanisms and gamification to motivate students and consequently resulting in higher academic achievement [11-14]. But the role of set induction in student engagement and motivation among medical undergraduates has not been investigated.

Researchers have used anecdotes, visual images and videos as tools to deliver humorous content in classes [15]. Several studies have described how appropriate humor in a teaching setting can result in improved learning outcomes by reducing anxiety and promoting engaging and motivating behavior. The use of humor-based images can also stimulate emotional reactions and increase the attention span and retention of content more than words alone [15, 16]. On the negative side, an inappropriate use of humor has the ability to reduce the listeners' enthusiasm as well [17]. An analogy is the process of understanding a novel situation from an already familiar concept [18-20]. Food-based analogies are often utilized to describe pathological or dermatological lesions [21, 22], but their role in set induction has not been studied.

The aim of the study was to assess the perceptions of first-year medical students about three different methods of set induction used in anatomy lectures. The three methods of set induction included narratives, food-based analogies, and humor-based images or activities at the beginning of anatomy lectures. The objectives of the study were to estimate the following among first-year medical students: (1) difference in a questionnaire-based perception score between the three different types of set induction; (2) sex differences in the questionnaire-based perception score.

Materials and Methods

This was a single group interventional study. The study was approved by the institutional research and ethical committee of Sri Manakula Vinayagar Medical College, Puducherry, India. The study group included 150, first-year MBBS under-

graduate students. Their participation in the questionnaire-based session was voluntary. Informed written consent was obtained from every participant before data collection and confidentiality of all responses was maintained.

The set inductions were designed by the first author. A panel of one senior and two junior faculties provided suggestions on their appropriateness, classification, and mode of delivery. The set inductions were broadly categorized into narratives, food-based analogies and humor-based images or activities. The set inductions were projected visually followed by explaining its relevance towards the topic in a conversational style. The narratives included interesting storylines related to a discovery or the historical reason behind a structure. For example, in the lecture on skin and fascia, the contributions of Dr. Yannas, who developed artificial skin and Dr. Burke who used it to treat burn victims were used as set induction. In food-based analogies, students were asked to observe and describe images of food, followed by analogous comparison with the actual bodily structure and function. In the class on epithelial glands, bunches of grapes attached to the stem were used to demonstrate the secreting and duct components of salivary glands. Cross sections of the kiwi fruit were used to demonstrate the shape and nuclear location of simple columnar epithelium. The humor-based images or activities comprised of images of cartoon characters or an activity with their peers. In the lecture on anatomy of the arm, the cartoon character "Popeye" was used to correlate with Popeye deformity. In a lecture on the nerves of the upper limb, the students were paired to make funny and famous hand gestures and were later asked to correlate the movements with the muscles causing them.

These set inductions were introduced in the first five to seven minutes of the anatomy lectures. The narrative type of set induction (skin and fascia, front of thigh, and histology of bone lectures), food-based set induction (epithelium, epithelial glands, and connective tissue lectures) and humor-based set induction (anatomy of arm, nerves of upper limb, and histology of cartilage lectures) were introduced by the same lecturer to avoid bias. During the lecture session, the students were encouraged to associate the set induction with the lecture content. The set induction was also alluded during summarization towards the end of the lecture. The student's perception questionnaire was tested for internal consistency in a group of 18 students (Cronbach's alpha=0.717). A week after the completion of the above-mentioned lectures, the students were oriented to the categories of set induction and

were asked to fill a seven-item anonymous perception questionnaire (the questionnaire contained the same set of questions for different type of set induction) that utilized a 5-point Likert scale. This was followed by an open-ended feedback session on the merits, limitations, and area of improvement of set inductions for qualitative assessment. This feedback session was managed by a faculty member who was blinded to the objectives of the study.

The mean and standard deviation of the questionnaire perception score for different types of set induction was calculated. Repeated measures ANOVA was used to determine the difference in perception score between different types of set induction. Two-factor ANOVA with repeated measures on one factor was used to determine the gender difference in perception score between different types of set induction. The statistical analysis was done using VassarStats (Website for Statistical Computation) and a *P*-value of <0.05 was considered statistically significant.

Results

A total of 149 students (58 male and 91 female) completed the perception questionnaire. The students' perception score of the different types of set induction has been described in Table 1. Students felt that food-based analogies and humor-based images were more interesting, motivated them to participate in the lecture, and was explained with clarity and enthusiasm as compared to the narrative set induction. The familiarity of set induction varied between all the three differ-

ent types of set induction. There was no significant difference in the perception of the different types of set induction between male and female undergraduate students (Table 2). The students open-ended feedback yielded four positive themes and a few drawbacks about the set induction (Table 3). Out of 149 students, a majority of them (139 of 149, 93.29%) recommended the continued use of set induction in future lectures.

Discussion

Gagne's theory addresses, nine sequential steps for an effective instructional design. They include (1) gaining student

Table 2. Gender differences in the perception of set inductions

Perception questions answered by the students	Sex difference (male=58, female=91) Two-factor ANOVA with repeated measures on one factor		
1. The use of set induction was more interesting and enjoyable	Male	4.23±0.99	<i>P</i> =0.786
	Female	4.25±0.80	
2. The use of set induction motivated my participation in discussion	Male	4.23±0.94	<i>P</i> =0.193
	Female	4.28±0.81	
3. The set induction used was appropriate to the lecture	Male	4.44±0.78	<i>P</i> =0.236
	Female	4.34±0.82	
4. The use of set induction deviated my focus from the subject	Male	2.18±1.16	<i>P</i> =0.895
	Female	1.86±0.95	
5. The set induction described in the lecture was familiar to me	Male	3.48±1.31	<i>P</i> =0.118
	Female	3.62±1.13	
6. I could understand what the class was about from the set induction	Male	4.07±0.93	<i>P</i> =0.566
	Female	3.98±0.86	
7. The teacher was enthusiastic about explaining the set induction	Male	4.58±0.75	<i>P</i> =0.124
	Female	4.60±0.67	

**P*<0.05 indicates significant difference.

Table 1. The mean and standard deviation of students' perception for different categories of set induction

Perception questions answered by the students	Mean±SD			Repeated measure ANOVA	Tukey's B <i>post hoc</i> test
	Food-based set induction (n=149)	Humor-based set induction (n=149)	Narration-based set induction (n=149)		
The use of set induction was more interesting and enjoyable	4.36±0.85	4.41±0.87	3.89±1.00	F=25.5 <i>P</i> <0.001*	Food and humor based set induction differ significantly from narratives
The use of set induction motivated my participation in discussion	4.32±0.86	4.40±0.87	3.98±0.98	F=17.4 <i>P</i> <0.001*	Food and humor based set induction differ significantly from narratives
The set induction used was appropriate to the lecture	4.42±0.91	4.33±0.89	4.31±0.85	F=1.7 <i>P</i> =0.18	Not applicable
The use of set induction deviated my focus from the subject	2.01±1.02	1.94±1.05	1.96±1.12	F=0.42 <i>P</i> =0.65	Not applicable
The set induction described in the lecture was familiar to me	3.98±1.16	3.57±1.20	3.07±1.20	F=38.97 <i>P</i> <0.001*	All three groups of set induction differ significantly from each other
I could understand what the class was about from the set induction	4.11±0.85	4.03±0.91	3.82±1.03	F=6.95 <i>P</i> =0.0011*	Food and humor based set induction differ significantly from narratives
The teacher was enthusiastic about explaining the set induction	4.70±0.63	4.62±0.71	4.40±0.95	16.37; <i>P</i> <0.001*	Food and humor based set induction differ significantly from narratives

**P*<0.05 indicates significant difference.

Table 3. The student's feedback on merits and drawbacks of using set induction in lecture

Student's feedback	No. of responses
Student's opinion on merits of set induction	
Fun, interesting and easy to understand	67
Useful as a memory aid during recollection in exams	39
I could relate the learnt knowledge and became more involved	12
Useful in providing an outline about the lecture	6
Student's opinion on drawbacks of set induction	
Some characters described in set induction were not familiar	4
Food slides made us hungry and deviated my attention	9

attention, (2) informing students of the learning objectives, (3) recall of prior learning, (4) presenting the stimulus, (5) providing learning guidance, (6) eliciting student performance, (7) providing feedback, (8) assessing performance, and (9) enhancing retention and transfer [3]. However, there is no data regarding the use of set induction and its impact on lectures in medical teaching. An informal feedback from the previous batch of students revealed that the perceived lectures were monotonous and needed to be made more interesting. Hence, in an effort to encourage student participation during lectures, different methods of set induction were designed and implemented for the current batch of students. The present study describes the incorporation of set induction in anatomy lectures and the evaluation of student's perception about different types of set induction among first-year MBBS undergraduates.

The students' age involved in the study ranged from 17 to 19 years, which is lower than the age range of the western population [23]. White et al. [24] have found that students are reluctant to participate in active learning because they have not yet achieved the cognitive developmental level compatible with adult and active learning principles. It thus becomes imperative for the lecturer to engage and motivate students during lectures. Easton [25] have described the use of clinical vignettes, patient experiences and personal narratives of teachers' professional careers to promote student engagement and provide the relevant context during lectures. Among the various methods, students were more interested in narratives with character-driven plots and emotional struggles to achieve a goal [25]. Ventura and Onsmann [26] used short clipings from popular movies during the lecture to motivate and maintain the interest of large classes. However, in a class of students with varied learning styles, relying only on narratives or visual cues could possibly benefit only a subset of students. The timing of the trigger is another factor to be considered.

Whereas set induction is utilized at the beginning of a lecture, other articles describe the engaging activity in the middle of the lecture [27, 28]. In the current study, the utilization of different methods of set induction in lectures was to gain an insight into the interest and motivation pattern of the learners, so as to improve learning outcomes.

Food-based analogies were chosen for set induction because it was felt that students would tend to have a pre-existing contextual experience that they could easily relate to the new information being taught. Students felt that the use of food-based analogies and humor for set induction during lectures was more interesting, enjoyable and motivating when compared to narration-based set induction. According to researchers, student engagement has three distinct dimensions namely, behavioral (involvement in academic activities like being attentive and asking questions during a session), cognitive (willingness to exert the effort necessary to comprehend complex ideas), and emotional (affective reactions in the classroom, including interest and anxiety) [29]. It is likely that the food-based analogies and humor for set induction were better at tapping into the three dimensions of student engagement as compared to the narrative based set induction. Gender differences have been identified in learning styles, academic planning activities and learning outcomes [30, 31]. However, in the present study, there was no significant difference in the perception about the general use of set induction between male and female undergraduate students.

In the field of anatomy, researchers have used limericks, comics, body painting and mime to engage and motivate students [28, 32-34]. According to the self-determination theory, student motivation is a dynamic process which can be enhanced or reduced during the learning process [9, 10]. Two types of motivation principles, intrinsic and extrinsic, have been discussed in the literature. Intrinsic motivation is based on internal factors such as self-interest, curiosity, challenge, and enjoyment. Extrinsic motivation is regulated by an external factor like rewards, avoiding punishment and promoting self-esteem [9, 10, 35]. Studies focussing on limerick development and gamification, targets the challenging, and self-interest side of the learner [13, 14, 33]. Whereas set induction is likely to motivate students by stimulating their curiosity.

In anatomical comic strips, the humorous element is usually incorporated after the anatomical aspects [32]. But when the student fails to acquire the required knowledge, the purpose of using the comic strip may not be fulfilled. However, while using humor-based set induction methods, the provok-

ing element is introduced to initially catch the student's attention followed by self or assisted correlation of the acquired knowledge with this element. Students often appreciate the humor in lectures, and when combined with meaningful content, it enhances the learning experience [15, 16]. Liu et al. [16] stated that 87% of medical students and teachers agreed with the effectiveness of using humor in a didactic lecture setting. Among them, humor-based clinical cases were the most preferred and effective method of incorporating humor in lectures [16]. The use of humor created a relaxed environment during the lecture. However, 42% of teachers perceived that they lacked appropriate humorous materials related to course content [16]. The present study could provide a useful resource on the use of cartoons and humor-based activities to involve the students and promote academic integration.

Since the set induction element was introduced at the beginning of the lecture, assessing its impact on the congruence or deviation from the subject might be useful in making future improvements. In general, the students felt that all three methods of set induction were appropriate for the lecture and did not alter their focus from the subject during the learning process. However, some students felt that food-based analogies made them hungry and anticipate their lunch break. This kind of subtle concentration loss should be anticipated by the lecturer and the discussion should be channeled appropriately.

Significant differences in the familiarity with the method of set induction between the groups were observed. The descending order of familiarity was with food-based analogies, humor, and narratives, respectively. For example, in the lecture on cartilage, an image of "payasam" (a traditional Indian dessert) was used to elucidate the histological features of cartilage. The students were excited and could easily relate it to topic. In the lecture on the histology of bone, a picture of a broken bone china plate was projected, and the students were asked whether or not a bone if dropped would break like this. Using the students' responses as a scaffolding, the importance of collagen in maintaining the structural integrity of the bone was discussed. However, familiarity alone does not guarantee the effectiveness of set induction. In the lecture on the front of the thigh, tailoring and football were used to explain the actions of the sartorius and quadriceps femoris muscles. Though familiar to the students, these analogies did not create the expected excitement among them. In the previously mentioned class on the histology of the bone, the lecturer used the cartoon "Wreck it Ralph and Dr. Felix" to discuss the

properties of osteoclasts and osteoblasts. Some students could not understand the correlation because of lack of familiarity. Therefore, it seems that familiarity, though important, is not a prerequisite for the effectiveness of set-induction.

This study has a number of limitations. Student's learning outcomes were not assessed in the current study. As the present study focused on anatomy lectures among first-year undergraduate medical students, the generalizability of the results to the other areas in the curriculum cannot be assumed. The ideal study design to test the effectiveness of the different methods of set induction would have been a randomized control design. However, due to logistic reasons, this was not possible.

This study shows that set induction used during anatomy lectures was perceived by the students to assist their learning. Among the methods of set induction, food-based analogies and humor were perceived to be more effective than narratives. The results of the current study suggest that a well-designed set induction could be routinely added to the other more widely researched tools to make lectures more interesting, interactive and effective. Further research could focus on the effect of set induction on short and long-term learning outcomes from lectures.

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Author Contributions

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Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

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