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Original Research

Five-year trend of competitiveness and knowledge-gaining attitude of university students; Evaluation based on an event of continuing health sciences education

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ABSTRACT

Though the trend of competitiveness among students has been found to be declining recently, there are seldom reports analyzing the same among university students from biotechnology, life sciences, medicine, dentistry and veterinary sciences. The objective of the study was to analyze the trend of competitiveness of undergraduate and post-graduate students from a developing nation. This was done by a retrospective analysis of the data on participation of the students in a continuing health sciences education event that had both active knowledge-gaining (AKG) components such as quiz and passive knowledge-gaining components (PKG) such as plenary lectures as parts of the event conducted every year from 2006 to 2010 in that nation. The results showed a statistically significant linear trend in participation (p-value <0.0001) and a declining AKG event participation over the five years in a trend analytical comparison with PKG events' participation which remained relatively stable over the years indicating a declining spirit of competitiveness. Further analysis into this declining trend revealed several pitfalls in the current education system of that nation. The findings raise alarms calling for the need to implement steps to modify the current education system, improve the attitude of the students and encourage them to participate in AKG events thereby developing a strong and more courageous younger generation, which will be able to optimally contribute to the society.

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INTRODUCTION

A common notion prevailing in today's world is that the youth lack courage to face defeat. There exists a general opinion that the competitiveness and the thrust to push forward through the hurdles of life among students in the developing countries is gradually waning due to various factors [1]. Innovations in science, especially in biology is accomplished by a

team work with tolerance, sportsmanship to accept failures appropriately, ability to retrospectively learn from the pitfalls and correct the earlier mistakes for achieving success in the future. Facing healthy competitions with involvement is the key to learn those qualities for budding scientists, failing which, innovators who are expected to play an active role

might end up being simple passive spectators. With these perspectives in the background, we report our assessment on the level of competitiveness among students in a developing nation from the fields of medicine, biotechnology, veterinary medicine, dentistry and life sciences and their attitude of participating in active knowledge-gaining events (AKG) versus passive knowledge-gaining events (PKG). This was done by a retrospective analysis of the data on participation of the students in a knowledge propagation event that had both AKG and PKG components as parts of the event conducted every year from 2006 to 2010 in that nation.

AKG refers to an event such as quiz in which an active participation from all the participants before and during the event is mandatory. Before the event they have to prepare themselves to be well informed so that during the event they will be able to answer the questions from the selected topics given well in advance. PKG refers to an event, where there is no mandatory preparation by the participants before the event. During the event, they have to merely be a passive listener to others either delivering a lecture or interacting among themselves. In the country where the quiz was held, in the stream of medicine, the under-graduate curriculum mandates 80% attendance in AKG and PKG type of events to appear in the examinations [2]. In post-graduate medical education also participation in such events is mandatory [3]. This holds same for dental sciences and veterinary sciences. In the stream of life science education and biotechnology, 75% attendance in activities like seminars, group discussions etc is compulsory to appear in the exams of under-graduation and post-graduation courses [4,5]. Though these regulations do not differentiate between AKG and PKG events i.e. they do not state particularly as to attendance in which type of event is mandatory or carries more credits, studies reveal that AKG type of events help the students with a better retention of information than students who attend PKG type of events, improving their overall academic performance and helping them with an in-depth learning [6-8].

METHODS

Structure of the Event:

The event under consideration is a continuing health sciences education and knowledge propagation event organized annually in the month of October by a regenerative medicine institute and the event has both active participatory and passive knowledge-gaining events. The quiz, the active participatory component, is an exclusive one on stem cells and regenerative medicine held for students in biotechnology, medicine and veterinary medicine, life sciences and dentistry at a national level. It is worthwhile to note that there is no

separate paper on stem cells and regenerative medicine in the curriculum of life sciences, biotechnology, medicine, veterinary and dentistry in the country where the event was held. However the students read the basics of stem cells and regenerative medicine as a part of biology in their curriculum. The quiz was started in 2006 and since then is held annually with the latest conducted in 2011. In this article the feedback of the event from 2006 to 2010 was considered for evaluation. All these five years, the quiz was held on a Saturday after the first week of October, when there are neither any examinations held in the educational institutes in the above mentioned fields in the country nor do any major holidays fall in. Thus, there is no deterrence to the participation. The quiz was conducted as an inter-institutional quiz competition on stem cells and regenerative medicine for undergraduate and postgraduate students as a regional event for the first three years and from 2009 it was open to students and scholars throughout the country in these fields.

The standard components of the event from 2007 till 2010 were:

- Quiz- AKG component
- A plenary session of invited lectures – PKG component
- A symposium – PKG component
- In 2009 and 2010, a poster Session was included as a part of the event, but the data was not taken into consideration in this article because the poster session can neither be included in the active component fully nor in the passive knowledge-gaining component. The participation was also rather negligible.

It was a full day event and online registrations for the event was opened for the students three months ahead. Students from surrounding areas came on a day's trip to participate and those from faraway places had to travel and stay overnight, which cut down expenses involved to a great extent compared to other such events worldwide [9,10].

The quiz had a preliminary session and then the final rounds. The preliminary session was a written quiz with a set of multiple choice questions. All the students who had registered for the quiz attended this preliminary session in teams of two members per team. The six teams who scored the highest marks in this preliminary session participated in the final rounds of the quiz which was held on the stage in front of an audience with most of them being PKG participants. The same type of quiz was held every year. The quiz questions were framed by a team of practicing clinicians, clinical researchers and basic scientists, two members in each category every year and passed on to

another peer group with balanced participation from all relevant fields. Though the questions framing was not double blind, review by the peer group ensured that they are of significant importance and relevance to the various streams to which the participants belonged. A set of sample questions of the final rounds of the quiz is presented in Table 1.

Information propagation and incentives:

The announcements to students were sent in the first week of July giving sufficient time for their preparation for quiz and also planning their trip to participate in any one or all the events. The dissemination of the information about the event was done by sending event announcement circulars in advance to the heads of institutes in medicine dentistry, veterinary sciences, biotechnology and life sciences and also to the heads of the faculties such as Biotechnology, Molecular Biology etc. in nearly 1000 institutions in the country. Apart from this, a wide publicity was given through media coverage in the national and regional newspapers. The organizing committee uploaded the event in academic and research event-announcement related sites in the worldwide web, but not in the social networking sites.

The event was sponsored by a public charity organization supporting research and registration fee was a nominal amount of USD 6-11. AKG event participants were given a special incentive, which allows them to pay half the registration fee per person as encouragement to them throughout the five years, while PKG event participants were charged the full registration fee, which was also nominal. The total number of participants, including invited guests and speakers, were restricted to 300 and in order to give preference to AKG participants, registration which was done exclusively online, was kept open for AKG participants till the second week of August. Only after the completion of the registration of AKG participants,

the registration for PKG events was enabled. If the registrations exceeded 300, the registration for all the events was stopped.

The details of the prizes awarded to the winners and runners of the quiz are given in Table 2.

Data collection from the participants:

Three feedback forms were provided to the audience to get their feedback on the quiz, the plenary session and the symposium (PSS). The forms were given during the following time intervals during the event: one immediately after the quiz's preliminary session in the morning; one after the plenary session lectures; and the third after the finals of the quiz and the symposium. The feedback regarding the quiz was received from the student participants of the quiz. The feedback regarding the plenary session and symposium was received from the participants of the quiz and those who attended the plenary session and symposium. These forms were thoroughly analyzed to collect the data presented in this paper. The feedback forms contained a set of meticulously planned questions to obtain the views of participants. A sample of the feedback questions has been given in the form of a table (Table 3). The data was analysed by a team consisting of statisticians, clinicians and researchers.

The feedback forms served as a valuable guide to understand the expectations of the participants to improvise further and also helped in understanding many important issues surrounding the students' interest in participation, the existing trend of competitiveness and the current status of biotechnology, which forms the essence of this article. The discussion of this paper is mainly based on the feedback provided by the participants, which was analyzed in various aspects to arrive at several hypotheses and conclusions that are discussed below.

Table 1. Set of Sample questions of the final rounds of the quiz

Question 1:	Which is the first extinct organism whose genome has been entirely sequenced?
Question 2:	Which cell-surface marker is used widely for identifying hematopoietic stem cells derived from the bone marrow and what is the common investigation to ascertain the same?
Question 3:	What is the term in ethics that describe the set of conditions in which professional judgement concerning the primary interest like patients welfare or validity of research tends to/or appears to be unduly influenced by a secondary interest like personal gain or financial gain?
Question 4:	Which is the only organ/tissue transplantation that doesn't need any kind of tissue matching like Blood group matching or the HLA matching for transplantation?
Question 5:	In the absence of mitotic signalling, which of the following processes might a cell undergo? a. Differentiation; b. Quiescent stage; c. Apoptosis; d. All these three choices are correct

Table 2. Details of the prizes awarded to the winners, runners and other finalists of the Quiz

Winner	0 Per team + Merit certificate + Rolling Trophy
First Runner Up	0 Per team + Merit certificate
Other four teams which made it to the finals	Certificate of appreciation USD 200 Per team + Merit certificate + Rolling Trophy and USD 100 Per team + Merit certificate

Table 3. Set of sample questions from the feedback form given to the participants

<p>1. The questions of the final rounds of the Quiz were</p> <p style="padding-left: 40px;">a. Very tough; b. Tough; c. Easy; d. Very Easy</p> <p>Other comments _____</p>	
<p>2. Source of my preparation to the quiz was</p> <p style="padding-left: 40px;">a. Internet; b. Journal; c. Text books</p> <p>Others- please specify: _____</p>	
<p>3. I study</p> <p style="padding-left: 40px;">a. Medicine; b. Biotechnology; c. Veterinary; d. Dentistry; e. Life sciences</p> <p>Life Science Student - Please specify the subject _____</p>	
<p>4. My purpose of participating in this quiz was</p> <p style="padding-left: 40px;">a. To know what's happening in the stem cell world; b. Interest in participation; c. Peer group persuasion</p> <p>Others- please specify _____</p>	
<p>5. On completion of my course, I want to become</p> <p style="padding-left: 40px;">a. Clinical physician; b. scientist in stem cells; d. scientist in genetics; e. scientist in other fields; f. entrepreneur</p> <p>Others- Please Specify _____</p>	

RESULTS OF THE FEEDBACK DATA ANALYSED:

Trend of Participation in Quiz:

The number of participants was neither decided from pre-registration nor those who picked up name badges. The certificate of participation was provided to the participants only at the end of the event each year. Before picking up the certificate, the feedback forms given to the participants were received, from which the participants' number was calculated. The quiz and symposium was first started in 2006. The plenary session was an additional fixture since 2008. However, the number of participants in the quiz has seen a steady downward trend. In 2006, when the quiz was first started there was an overwhelming response with 107 teams participating in the event. Each team comprised

two students and in all, 214 students participated in 2006. These participants were from streams of medicine, veterinary science and various branches of life sciences and it was held as a regional event. In 2007, there were 75 participant teams (150 students), while 2008 had only 52 teams (104 students) participating. The scope of the event was increased to a national level event since 2009, with participants being invited from all over India. There was a marginal increase in participant numbers in 2009 as a result – 64 teams comprising of 128 students. However, holding the event on a national level did not help in increasing the trend with regards to number of participants in the AKG group. Participation in 2010 declined again to 53

teams (106 students), in spite of continuing to hold the event on a national level.

Trend of Participation in Plenary Session and Symposium:

The symposium was conducted from 2006 - 2010 along with the quiz, while the plenary session was included from 2008. The number of participants for the Symposium and Plenary session was relatively stable from the beginning, i.e., in 2006 till 2010 (Figure 1).

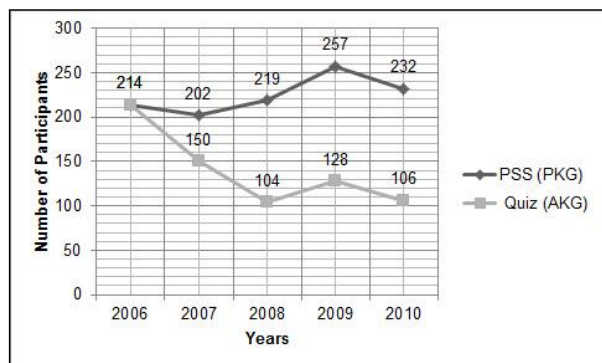


Figure 1. Trend of participation of the students in the PKG and AKG events from 2006 to 2010

Comparative Analysis:

The Chi-squared test for the participation trend revealed that there was a significant linear trend (p-value < 0.0001) and the results indicated that there was indeed a decreasing trend in participation in the AKG event compared to PKG event over the five years. In five years time, the number of participants became halved in number. Throughout, there were a stable number of participants in PKG, with a marginal increase when the event scope was raised to the national level. The mean value of participation along with the standard deviations is depicted in Figure 2. From these data, it can logically be inferred that the number of participants interested in participating in PKG type of events was stable compared to AKG kinds of events. In the first year, PSS was open only to quiz registrants since 214 students registered for the quiz and hence the number of quiz and PSS participants is the same as evident from Figure 1.

Other parameters analysed

Trend of Participation of Institutes:

Though invitations for participating in this event was sent to nearly 1000 institutes of life sciences, dentistry, biotechnology, veterinary medicine and medicine all the five years, the number of institutes that participated was very minimal with an average of 11 medical institutes and 29 life science Institutes participating every year (Figure 3). The Chi-squared test for the

participation trend of Institutes indicated that there was not any significant linear trend and the p-value was also insignificant (p-value=0.9090). The participation number of institutes remained stable all through the five years.

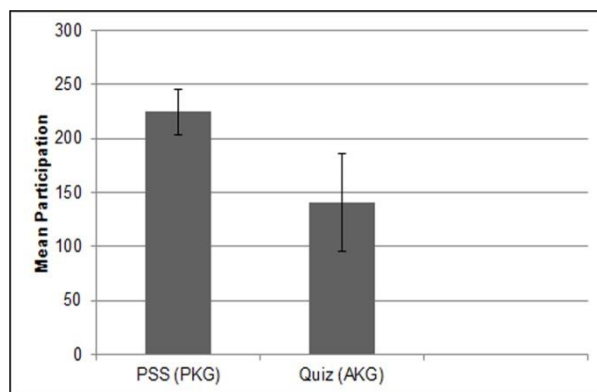


Figure 2. Comparative mean value of participation of students in PKG and AKG events from 2006 to 2010

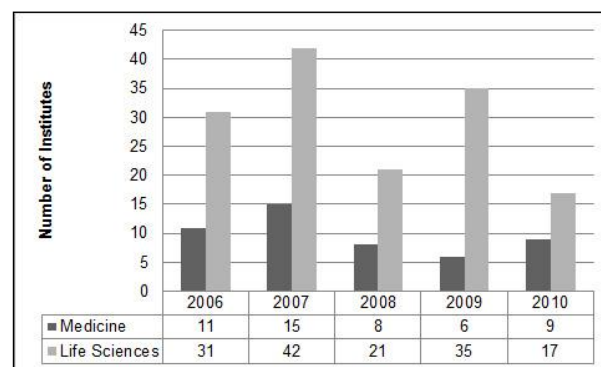


Figure 3. Trend of participation of Institutes in the events from 2006 to 2010

Nature and appeal of the Quiz questions:

A majority of the students found the questions in the Quiz finals to be tough. This was inferred from the feedback forms of the participants who had answered this question in all the five years. Among the 256 students who answered this question, 163 found the questions to be tough, 32 students found it to be easy, 3 students found it to be very easy and 58 students answered that the questions were very tough.

Source of Preparation:

When the students were asked about the source of preparation for the quiz, from among 249 students, who answered this question in all the five years combined, 105 students quoted as textbooks, 115 as internet and only 29 students mentioned the source to be journals. The trend of students' source of preparation for 2007, 2008, 2009 and 2010 is given in Figure 4.

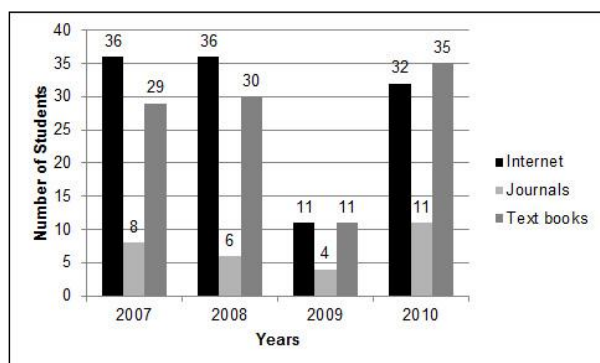


Figure 4: Source of preparation of the students for the AKG event from 2007 to 2010

Reasons for participation in Quiz:

When the reasons for participation in the quiz (AKG component) was analysed, it was observed that 84% of the students wanted to gain awareness about the latest in the field of stem cell research by participating in the quiz, while 12% participated due to persuasion of friends or peers. About 4% of the students stated varied other reasons such as interest in participating in quiz, for the pleasure of winning in the quiz, to hone their skills by participation in quiz etc.

Career Choice of Quiz Participants:

Only 6% of the participants, when asked about their career choice, wanted to be entrepreneurs in their field, while 94% wanted to be scientists in the field of their choice.

DISCUSSION

In five years time, the number of participants is halved in AKG event. A logical explanation is that any new program will attract more numbers initially, and then the decrease starts and later the participation will become stable. There were multifold other reasons for the declining trend. Informal conversation with the teaching faculty who accompanied the participating students, and attended the PSS, led us to believe that, this decline in interest was simply a reflection of way of learning. Most students are academically inclined, but are passive seekers of knowledge rather than active pursuers, according to the teaching faculty.

The conversation with the students threw up another reason that they were willing to put in effort that a quiz of such high standards and magnitude would require but unwilling to traverse the proverbial extra mile for fear of ridicule from peers and family in the event of not being successful. The participation in the PSS was knowledge imbibing, but not knowledge testing. Hence, there is better response for PSS as there is no

gauging of their knowledge in participating in this component. It is well known that performance is influenced by fear of defeat and shyness [11,12]. Since the students already have a fear complex, this prevents them from participating in AKG events.

Another fact that the students are more willing to settle for a salaried job than becoming an entrepreneur, which according to them is more risky point to a lack of confidence among the student community which needs to be attended to immediately.

It has been observed in a study that the choice of answers to a question strongly depends on the domain familiarity of the question [13]. The fact that the students find the questions to be tough leads us to infer that the students do not keep themselves updated on the latest happenings in the field of their interest and hence do not find the questions to be familiar leading to attribution of “toughness”. The feedback forms seemed to suggest that the lack of participation was due to the tough questions. However, majority of the students conflicted that they cannot get access to high impact peer reviewed journals due to monetary constraints as several journals that come at high relatively subscription costs [14]. It is, therefore made a mandatory criterion for the institutes to have a well equipped library and access to high impact peer reviewed journals.

Another information as inferred from the feedback forms and by interaction with the students was that the students participate in academic meetings with the sole intent of obtaining credits as their curriculum demands participation. The decrease in participation in AKG event, but continued increase in participation in PKG events can be attributed to this reason wherein students would like to attend these lectures for credits, but not participate in quiz because there are no extra credits for quiz which requires an extensive preparation. To overcome this issue, it is suggested that the government and regulatory authorities must ensure that more credits are assigned for AKG type of events.

There are literatures from the rest of the world that have assessed the level of participation in conferences, the advantages and disadvantages, the motivating factors and the demotivators. [9,10,15] A review of these literatures indicate that there are two major hurdles in attending such events which are physical (the need for exhaustive travels) and monetary (the participation fee is quite high) constraints. The event in this consideration had a very nominal participation fee and it was conducted in one of the major metropolitan cities of the country with well-connected network of trains, buses and other modes of transportation. Therefore the hurdles mentioned above in attending an event may not be the cause for the decrease in

participation that too only in the AKG component and not in the PKG component of this event.

What developing countries needs today for true progress in fields like biotechnology and medicine is perseverance on carefully planned work protocols and professionals driven by passion, rather than pressure [16]. The main objective of this article is to emphasize that students must be provided with an education system that fuels their passion and not their pressure. Students from such systems only can become inventors and discoverers of tomorrow's technology for the betterment of future of not only the nation, but the world as a whole.

This data is based on a single event and to conclude results in a precise manner, further research and surveys are required. Moreover, all the students who participated did not fill the feedback form which is a limiting factor. Also taking part in AKG events is not the only way to gauge the competitive edge among the students. However, this study gives a first-hand insight into the prevailing attitude of students towards such knowledge-based events, which in future can form the basis of a larger study.

CONCLUSION

The reflections of this study throw light on several issues about today's life sciences students, the future leaders to drive science and research in developing nations. In general, the trend of the students is drifting towards passive learning due to fear of facing failures in events where there is need for active involvement and competition. This being an eye opener, we hope that the teaching faculty, educationalists, policy makers in science and research would implement systems to improve the attitude of the students in their respective countries in favour of encouraging competitive spirit to develop a future generation with strong fundamentals. Nurturing the future generation in a manner that they will not be reluctant to face the challenges both in personal and professional life will pave way for better science and a better tomorrow.

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Conflict of interests

The authors declare that they have no conflict of interest.

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