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Interactive Educational Activities and Their Impacts on Student's Innovation, Teaching and Learning at Jubail Industrial College (KSA)

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Abstract Jubail Industrial College (JIC) located at the Jubail Royal Commission (RC), eastern province in the Kingdom of Saudi Arabia. The Jubail industrial college organized an in house Engineering Open Day of academic student activities. Undergraduate engineering students from different JIC specializations presented scientific projects to pupils from secondary schools in an interactive and fun learning way. The Engineering Open Day included engaging, enjoyable science competitions, open group discussions sessions on the topics of science and technology. It also provided the opportunity for some capable JIC students to improve their communication and presentation skills. In addition, the day's sessions provided a fantastic opportunity for educators to observe student participation at close hand, to discover and to help develop their talents. In turn, the activities encouraged greater creativity and innovation among the groups of visiting secondary students through the exploration of areas of science and new subject areas not usually available at the high school level. In general, it is suggested through this article other type of arrangements when it comes for promoting student's skills and creativity worldwide. It was demonstrated in figure one most necessary requirements for publishing in international journals of education.

Keywords: *high School, introductory chemistry, interactive education and innovation, outreach, Second-Year undergraduate, demonstrations, interdisciplinary/ multidisciplinary, continuing education, Cooperative Learning, discovery learning, Jubail Industrial College (JIC), Promoting Innovation for Industrial Growth'*

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1. Introduction

The participatory application of theories and concepts is one where individuals or organizations interact, engage in information exchange, do problem solving and group study. Such a way of interacting between students and their instructors encourages young academics to learn science more readily by stimulating their interest and helping in the promotion of the clearer understanding of how science works. Equally instructive are the teaching methods and mode of delivery since they are the key to building student knowledge and improving exam performance.

Better teaching can be achieved by linking educational concepts that are taught as different engineering or science subjects with engaging educational college activities in a fun or interesting way. In doing so, students readily absorb knowledge and complex ideas from their teachers and apply them in very practical ways for their better understanding. Using this interactive method, fundamental science concepts can be delivered more interestingly and easily for the event, a select number of JIC students from various departments were asked to lead other student groups and be responsible for organizing meetings and preparing answers to expected questions, listen to each other and be ready and accept feedback and criticisms. In addition, demonstration presentations were conducted before the actual presentations were offered.

The whole exercise gave these students valuable experience in leadership and organization of science teams together with the practical teaching and communication experience with secondary school science students. The process in the course of preparations and execution was carried out with minimal instructor supervision. The objective of the Engineering Open Day activities at Jubail Industrial College (JIC) was to highlight the various effects of interactive learning on student innovation, leadership and creativity styles.

Also, the current paper aims to highlight awareness of the importance of science activities in schools and colleges. In addition, it shows how such activities help promote effective student leadership and the accomplishment of educational authority goals and targets; skills necessary in today's fast developing world. Conducting educational activities such as in the Engineering Open Day, academics create opportunities to establish more frequent interactions between students helping them to be responsible learners, more proactive in preparation of knowledge and better able to deal with and to explain concepts and ideas to others. Also during the activities, students answer questions and get expert feedback on their project development. In

all, students become active learners, much closer to the learning environment where in the future they will become more enabled to share ideas, projects and accept critical feedback on resolving developmental issues.

1.2. The Creation of Student's Activities to Meet Learning Objectives Introduction

Four secondary schools in the Royal Commission of Jubail area; Um Al-Qura School, Al-Deffi School, Al-Ruwad School and Al-Ahssa School were invited to JIC College's Engineering Open Day. Students participated in the various interactive and entertaining scientific competitions created set up by the specialized academic staff group from Jubail Industrial College (JIC). The efforts invested in the scientific event hugely benefited all students. Recommendations and examples from the literature were also considered to plan for this activity, instructors have also used outreach efforts as a platform for university students to participate in service learning [1-8].

2. Planning and Activity Guidelines

The engineering activities on offer on the day were interesting and engaging. Students became very involved in the learning process. This fun, highly interactive approach held the students' attention and overall it was found to be an effective way to motivate and inspire the next generation to consider careers in the fields of science and engineering. Activity implementation is divided into the following routes. In order to achieve project goals, undergraduate students were tasked to come up with ways to increase school pupils' participation in activities and to formulate a set of guidelines and regulations.

They performed these tasks very well producing excellent guidelines related to protocol such as 'not interrupting others when they are talking' and ways to offer feedback such as 'critique of the school's ideas' and 'not cutting off the high secondary students when they are contributing or asking questions'. In addition, instructors tasked JIC undergraduates to present their projects in ways that engineering concepts might readily be understood by secondary level students according to their school curriculum and approaches to learning science in the manner they are familiar with.

3. Projects Approach

3.1. Overview in Brief Projects Conception, Development and, Implementation

Firstly, in groups or teams, students met to discuss theoretical ideas related to their projects. Then, these same student groups prepared projects after which they presented them initially to their peers i.e. other JIC students. Feedback from peers greatly helped to clarify ideas and methods. Finally, the JIC student groups presented their projects to the secondary school pupils and visitors during the open day. Later, team members recorded the entire process in written assignments showing how ideas and issues were developed, how challenges were dealt with and how typical problems were resolved. Before the Open Day, JIC undergraduates had prepared six 15-20 minute presentations after which they consulted their instructors who asked them questions in order to assess and support their learning. This process helped to advance their thinking and knowledge through a preliminary performance evaluation. Staff also discussed with undergraduates how to make effective presentations, the various improvements to communication skills and ways of working together in a team.

3.2. Projects Approach Overview in Detail

First, four groups of 3-4 students from the Departments of Chemical, Electrical, and Mechanical Engineering met together with some MIT students to learn about and to discuss the theoretical ideas and concepts related to their specific project ideas.

3.2.1. Objective and Benefit

Objective and Benefit in multidisciplinary groups, students developed their thinking, project ideas and gained experience in team dynamics and activities.

3.2.2. Rationale

Normally, JIC students study and work alone rarely getting the chance to discuss and develop their theoretical ideas nor do they normally get a real opportunity to develop a practical understanding of concepts and ideas. Secondly, each of the four teams prepared initial drafts of their engineering project presentations. Instructors set a time limit of 15 minutes per presentation, after which each of the four teams gave a dry run presentation of each project to their peers i.e. other JIC students. Each dry run was followed by an in depth discussion with other JIC students in order to seek deeper understanding and greater clarity about the project ideas and ways to improve its presentation.

3.2.3. Objective and Benefit

To have JIC student team members and presenters clarify their thinking about theoretical concepts, to improve and develop clear ideas for comprehensive and project presentations in ways, which are relevant to secondary students' understanding and educational levels.

3.2.4. Rationale

In the future workplace, students will almost certainly be asked to perform job tasks in teams and under critical time pressure. This skill needs to be developed beforehand in a controlled but safe, practicing college environment. The 15-minute project timing pressured and challenged the teams to be specific and well organized.

In the future, especially in the private industries, such kinds of activities will bring students closer to the workplace reality, prepare them and make them ready for future industry demands. The 15 minutes' project presentation time limit was imposed in order to give secondary school pupils more time to make their own contributions, to keep their attention and allow them time to share and to ask and answer questions. Thirdly in the final phase, each of the four JIC student teams presented their projects to the secondary school pupils scheduled on the Open Day.

During the presentations, the speakers stressed the importance of good understanding of theoretical concepts and their application in industry. For example, in the Electrical Engineering team's clarified the secondary school pupils about how ideas in physics subject might be relevant to the functioning electrical projects and how the theoretical ideas could be applied in practice. They asked questions about conductivity, current, calculations and the units required the program to work. Pupils were not only expected to answer simple questions but also to share ideas, respond effectively and present possible solutions to problems. This approach made the boys think more deeply about issues, problems and challenges. In another example, the Chemical Engineering student team presented a project entitled 'Separation Techniques'. Presenters questioned the secondary school pupils on the principles of the Separation of Liquids. Pupils in Secondary school are already familiar with the topic of boiling points of liquids in Chemistry classes. However, this project presentation endeavored to build on that knowledge by visually demonstrating the crude oil separation process in more depth and detail. The goal was to build on, advance and capitalize on pupil's current knowledge and to create more advanced projects. Secondary students can look through this exceptional project a visual project for applying the knowledge with applied industrial needs linked to the separation of petroleum.

4. Description of the Event Impact on Student's Skills and Learning Integration with Literature

4.1. Enhanced Students Skills

The general educational goals of the project are not simply to have students learn in the classroom; rather they are much broader in scope and their accomplishments more far reaching. The presentations and interactive activities in the sessions play a crucial role in the nurturing and honing of skills and abilities of the secondary school students. These also include both academic and personal including the fostering of individual talents, making confident personalities, developing good classroom behaviors and increasing beneficial study attitudes and in literature was mentioned about such objectives [9-13].

In addition, the session activities help secondary school pupils to improve their communication skills. Here, the learning environment is considered to be ideal. The pupils are trained and encouraged to express their views and opinions in an atmosphere of mutual respect and concern for others [14,15].

Writing skills are also improved through the documentation and reporting of event activities and outcomes. The literature reports that student-writing skills can be significantly improved through the initiation of relevant writing assignments [16]. Throughout the process, instructors advised the JIC undergraduate team members to make concerted efforts to reduce any fears or anxieties that secondary students might be experiencing in the sessions by working to create an atmosphere in which the pupils would feel comfortable to freely make contributions and not be afraid of thinking out-loud'. Implementing of the environments and conditions are most effective in promoting creative skills development in children and young people [17]. JIC instructors also encouraged undergraduates to take intellectual risks, to ask questions, and to acknowledge when students from the college fail to understand or grasp the concepts and to allow ample time for school pupils to think about points before replying to any of their inquiries.

Likewise, the undergraduate team members learned the necessity of fully listening to the secondary school students' questions and their answers, to avoid interrupting, to focus especially on, and to emphasize the students' comments and ideas. Undergraduates also encouraged greater participation by having pupils contribute and get them involved in their views, opinions and in the application of science in everyday life.

4.2. Enhancing Undergraduate student Participation and Collaboration

To achieve project objectives, JIC undergraduates were highly encouraged to actively work together and collaborate on assignments and tasks with their peers. This resulted in less dependency on the input of instructors and more reliance on the peer thinking and support. During this process, the team members sat together a number of times well in advance of the Open Day to analyze issues, think together through challenges and problems, share ideas, ask and answer questions in a constructive student led support environment. In this way, instructors were free to observe the groups, preparatory activities, offer support, record, assess how students worked together, and obtain a clear overview of how the writing project progressed [18,19].

In addition to meeting in their own teams to discuss individual projects, staff urged the team members also to meet up with the participants from other teams from different engineering disciplines and with different projects. The goal was to expose them to other unfamiliar ideas and concepts, to have them ask questions, to critique, to find and prioritize solutions and to express their findings in a clear and precise manner. The Literature on the subject of writing composition claims that generally science students' writing skills are weak. It indicates a lack of involvement in writing and a failure in their abilities to express in the clearest language terms their deeper connections and understanding of complex subject matters [20,21,22].

Motivating students to achieving a clear, thorough understanding of scientific principles and concepts is an essential prerequisite for successful practical application and innovation. Such knowledge greatly contributes to the correct 'doing of science'. To help motivate and to orient students towards better learning of science, 'The Framework of Scientific and Engineering' advocates eight important scientific and engineering practices like asking question and determining problems, how to develop different models, planning and investigations, analyzing and critical thinking [23]. With these approaches combined with the interactive educational activities described above, student learning increases greatly. In such a proactive learning environment, students engage intimately in the learning process, enhance their people and communication skills, gain vital critical thinking on various matters and are

empowered with greater responsibility in the teaching and management of peers and less experienced students. The combined process develops student thinking and innovative output [24-29]. Various academic journals have identified the key characteristics, environments and conditions that effectively promote the development of creative skills in young people [30]. Another study recommends special arrangements related to extending activity times and commitments to creative learning activities [31]. One of the important outcome from such event to explore student's information about ''event arrangements''. This will provide into more promoting innovative student's events in a significant international journal. Hence, it is suggested through this article establishing scientific event form (s) that highlight mainly all necessary information as shown as in figure one.

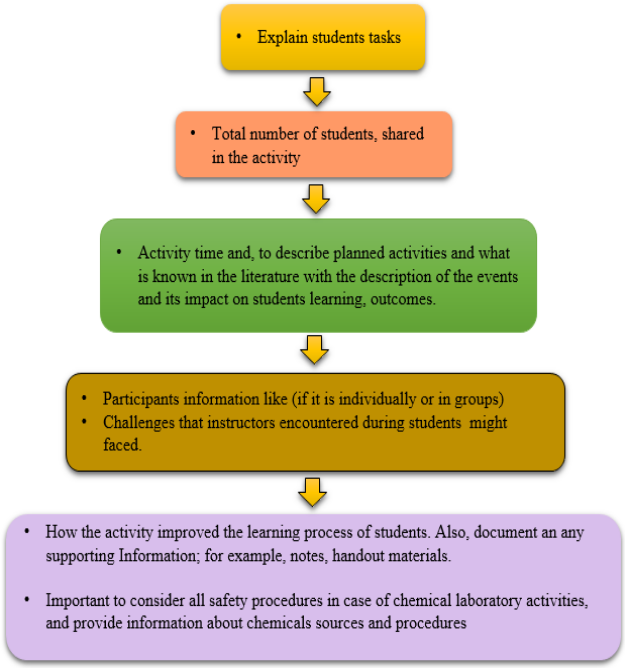

Figure 1. Collected most requirements for publishing outcomes of the scientific educational events, within international journals [1-31]

From the above figure, such arrangements will help in:

(a) Publishing students' outcomes in worldwide international journals, (b) gradually control the running of the event in before time (c) having an outlook to the requested budget with a correlation to the expected outcomes from the planned event (d) prepare more high level graduate students at early educational stage, in how to publish within international roles. And, understanding research and development concept skills, (e) serving community

JIC's community outreach efforts provided wonderful opportunities for secondary school pupils and teachers to discover, witness their talents and to see them in action. It was also very encouraging to see the enthusiasm and positivity in the JIC student presenters as they answered pupil questions.

4.3. Encouragement

Why JIC in Jubail is concerned with innovation and creativity?

Jubail Industrial College (JIC) is located at the heart of the huge industrial city of Jubail in Eastern Saudi Arabia. It is one of known and comes under the Education Jubail Royal Commission (RC) sector. Innovation in all industrial sectors in the region is the major driver of productivity improvement. In addition, today top management of educational sector at Royal commission including the JIC college management and Jubail wholeheartedly supports the efforts its teaching staff has made in setting up and implementing these types of interactive educational activities. Our future goals therefore are to further increase these kinds of learning opportunities that clearly contribute to the effective formation and preparation of JIC's students for future work in the industrial city and success in their chosen careers [32,33,34].

Education departments are working constantly to develop and implement more interactive programs that increasingly encouraging students themselves to be responsible for their own learning rather than depending always on instructors. Through their own efforts in research, discussions, asking and answering questions, making presentations, writing reports, communicating findings either orally or in written paper, we have found that students engage more readily with science and engineering and develop a much greater competency in science subjects [35-42].

In the first instance, JIC teaching staff is responsible for sourcing the experimental techniques, providing calculation models. At the same time, they collaborate closely with relevant and up to date ideas, innovations and insights provided by industrial partners in the preparation of college science curriculum and student projects. Feedback from partners in the local petroleum industry sets up a clear framework and vision in the correct preparation of content in science and engineering courses [43], the vital working approaches and essential critical thinking skills so necessary in the industrial work arena and in society in general [44]. Lee reported that reinforcing sound academic development and interpersonal experience in general produces healthy moral sensibilities in the study of the arts and humanities. The same can also be true for science students. Likewise, competency increases in science and technology, intellects and minds improve and enthusiasm and imagination flourish [45].

4.4. Praising Students

Praising students for a successful completion of a task is important. It was stated that 91% of 747 Australian children wanted to be praised for their achievements and behaviors [46]. JIC Management awarded certificates of achievement to all the projects participants in appreciation for their tremendous efforts that made the Engineering Day a real success. The interactive activities that combined science and fun competitions were highly praised by the students and the respected guests alike [47].

5. Conclusions

Interactive Science and Engineering Open day activity is of great benefit high to secondary schools. They are an excellent opportunity for educators to discover new talent

from amongst the undergraduate JIC students from the various disciplines. In the future, teaching staff intend to further collaborate with colleagues in all the departments to produce a range of multidisciplinary science and engineering projects. Moreover, during the process, close to fifty JIC undergraduate project participants greatly enhanced their innovative capabilities and leadership skills by practices and interactive learning. They also taught and exchanged ideas with secondary school pupils and youth educators. In essence, they learned how much value such academic outreach provides to the community. In addition, The existing distinguished infrastructure is considered to be equally an excellent environmental platform for innovation and creativity towards; industry and all students [48]

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