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(SMEC 20)

SMEC 20

Conference Proceedings

Science and Mathematics Education Center (SMEC)
Department of Education
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SMEC 20 MISSION STATEMENT

The SMEC Conference is an annual event designed to promote the continued development of a professional community of mathematics and science educators across Lebanon and throughout the region. Specifically, the conference aims to:

- Provide an intellectual and professional forum for teachers to exchange theoretical and practical ideas regarding the teaching and learning of mathematics and science at the elementary, intermediate, and secondary levels

- Provide a forum for teacher educators and researchers to share their findings with science and mathematics teachers with a special emphasis on the practical classroom implications of their findings

- Provide an opportunity for science and mathematics teachers to interact with high-caliber science and mathematics education professionals from abroad

- Contribute to the ongoing development of a professional culture of science and mathematics teaching at the school level in Lebanon and in the region

- Raise awareness of science and mathematics teachers about the array of curriculum and supplemental classroom materials available to them through publishers and local distributors

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*MyScience*www.myscience.com.auis an award-winning primary science and technology program that builds teacher capacity, uses inquiry learning, involves mentors with science expertise, and develops communities of science practice. This presentation will address, with classroom examples and research findings, how the program has been successfully implemented in a range of Australian schools through a sustainable model of collaboration between schools, industry/business and university sectors.

Plenary Session Mathematics

Changing ways of knowing in knowledge societies and implications for STEM teaching
M. Sencer Corlu, Bahcesehir University,, Turkey

In this presentation, I shall start by discussing the dynamic and complex nature of the problems that the individuals face in a knowledge society. The discussion will continue on how political, popular and pedagogical approaches to STEM education, in addition to those authentic problems of knowledge societies (cf. wicked or ill-defined problems) provided the Integrated Teaching Framework with a rationale and how the framework helped the investigator develop a year-long teacher professional development project for mathematics and science teachers in Turkey and elsewhere.
First-hand experiences of the principal investigator with regards to policy making, curriculum development, research and teacher education in STEM education will be presented along with several teacher-generated materials as interesting examples so that the audience can both appraise the impact of the project and reflect upon their own practices.

Research Sessions

Remédiation par interactions à distance des erreurs des élèves de seconde (Cas de la communication hormonale)

Diana Faraj El Abed & Assaad Yammine, Université libanaise- Faculté de pédagogie (Doyenné), Liban

Dans notre recherche action nous analysons l'accompagnement par interactions à distance des élèves d'une classe de la première année du secondaire suite à l'apprentissage du concept de la « communication hormonale ». Différentes activités sont mises à la disposition des apprenants, à travers diverses modalités d'intervention à distance (Whastapp, Facebook, Padlet) dans le but de remédier aux lacunes repérées. Les différentes activités proposées à distance ont aidé les apprenants à consolider certaines notions relatives à la communication hormonale. Ces activités ont permis aussi à ces apprenants de surmonter des difficultés au niveau du domaine de raisonnement scientifique, malgré la persistance de certaines lacunes.

Mots-clés

Accompagnement à distance, erreur, communication hormonale, glande, raisonnement scientifique, remédiation, TICE.

Introduction

Les investissements massifs dans les TICE en éducation ont suscité un nombre croissant d'analyses, d'études et de recherches sur leur pertinence et leur impact sur le milieu.

D'après Viau et Rolland (2005) ces travaux s'étalent principalement de 1995 à 2010. Les premières études ont été réalisées en Canada. Des institutions mettent en service des professionnels pour aider les enseignants à faire le passage « obligé » aux TICE : les techno-pédagogues. Et par la suite, d'autres aspects particuliers des usages technologiques en rapport avec des approches pédagogiques particulières: enseignement individuel, enseignement collaboratif, encadrement à distance, etc.. (Loisier, 2011) Plusieurs recherches (Gunstone et White, 1981 ; Halloun et Hestenes, 1987; Lochhead, 1988; McDermott, 1984; Viennot, 1979) ont mis en évidence les nombreuses difficultés que rencontrent les élèves dans la compréhension de concepts fondamentaux. De nos jours l'accompagnement en présentiel semble insuffisant pour surmonter ce genre de difficultés d'où la nécessité de la diversification des opérations assurant la remédiation adéquate. L'accompagnement à distance est un des dispositifs ayant pour but de remédier aux erreurs des élèves pour un concept bien défini tout en profitant des techniques modernes fournissant des supports diversifiés pour les enseignants et les élèves. Plusieurs études témoignent de l'avantage que présente l'accompagnement à distance par rapport à l'accompagnement en présentiel. Nous pouvons citer une recherche réalisée par Karsenti et Ngamo en Afrique (2007) dans laquelle plusieurs enseignants de SVT ont accentué le net avantage d'utiliser les TICE pour l'enseignement

de cette discipline au Sénégal. Une autre étude faite au Maroc a montré l'impact de l'utilisation d'une plate-forme en ligne pour la régulation des apprentissages et l'accompagnement des élèves en SVT. (Lakdim, El Ouidadi, Essafi, Sendide, 2012) Et l'université de Leicester s'est intéressée aux médias sociaux et à la mise en partage et de réflexion entre enseignants et apprenants de la classe de première année en biologie. Tandis que la fréquence régulière de Facebook par les apprenants disperse leur attention et serait l'une des causes des résultats faibles, selon l'université Ohio State. (Atelier, 2010) Au Liban, nous avons recensé une étude pour voir l'efficacité d'un blogue de remédiation dans le dépassement des erreurs des élèves de la troisième (EB9), en génétique. (Nahed, Bazane, El Hage, 2014)

A noter aussi que dans le cadre de l'initiative francophone pour la formation à distance des maîtres (IFADEM), le Liban a proposé depuis 2013 un dispositif de formation des enseignants intégrant le numérique et ayant pour but principal l'amélioration de leurs compétences dans l'enseignement dû et en français.

Suite à nos observations de classe de seconde, nous nous sommes rendus compte de l'existence de difficultés remarquables dans la compréhension du concept de la « communication hormonale », des difficultés qui se traduisent, entre autre, par l'échec des élèves en ce concept qu'avec un enseignement en présentiel et dans la lecture des documents à cause de la faiblesse en français. Notons aussi que la plupart des apprenants n'ont pas quelqu'un qui aide dans leurs études à la maison et ils ne se sont pas participés à des centres éducatifs pour l'accompagnement ; en plus à la manque de l'accès et l'usage des TICE dans l'enseignement et l'absence des laboratoires et la réalisation des expériences dans les écoles. Pour ce but, cette recherche action a pour objectifs la remédiation des erreurs faites par les élèves, mettre en place un dispositif d'intervention à distance, pour enfin analyser l'effet de cet accompagnement.

Par ailleurs, notre question centrale de recherche est : Dans quelle mesure les interventions de l'enseignant à distance contribuent- elles à surmonter les difficultés d'apprentissage des élèves de la seconde, dans le cas du concept de la communication hormonale ?

Méthodologie

Notre recherche action qui est déclenchée par un besoin de terrain (échec et difficultés des élèves particulièrement en « communication hormonale ») a eu lieu dans un lycée privé, au cours du second trimestre de l'année scolaire 2016- 2017. Le travail s'est étalé sur un mois entre travail en classe et à domicile : des pré- test et post-test ont été faits en classe, mais les interventions ont été faites à distance. Notre étude s'intéresse aux apprenants de la première année secondaire d'un établissement privé appliquant le programme libanais, il s'agit d'un groupe d'individus ayant les mêmes caractéristiques choisi par commodité. L'échantillon de cette étude est formé de 14 apprenants (7 filles- 7 garçons) dont l'âge est compris entre 15 et 16 ans.

En premier lieu, nous avons cherché à mettre en évidence les concepts développés chez les apprenants concernant la communication hormonale et à identifier les difficultés qui se rapportent au thème en question. Les principales difficultés résidaient dans l'appropriation du mode d'action des hormones, des dysfonctionnements de la thyroïde, des notions de récepteurs et d'organes cibles,… acquisition des capacités de raisonnement scientifique : Analyse, interprétation…

Après repérage des difficultés des apprenants, nous avons proposé un dispositif d'accompagnement et de soutien à distance. Ce dispositif comprend 4 activités différentes de soutien à propos du concept étudié, dont chacune a une durée différente de l'autre. Tout d'abord nous avons lancé une vidéo d'introduction (diffusée sur Padlet, whatsapp, et Facebook) comportant une introduction générale du chapitre de la communication hormonale ; suivie d'un

mini test comportant une série des questions courtes sur lesquelles les apprenants répondent individuellement. Ensuite nous avons affiché un schéma de l'expérience de Berthold concernant la communication hormonale par voie sanguine. Les apprenants étaient appelés à faire individuellement une description, une analyse et une interprétation de ce schéma. La 3ème activité a consisté en un affichage d'un document comportant des textes avec des figures de la thyroïde et ses dysfonctionnements. Un mini test comportant une série des exercices (Vrai/faux, QCM, questions à trou) a été traité individuellement par les apprenants puis corrigé et commenté. Finalement nous avons lancé une activité concernant les récepteurs spécifiques et l'organe cible, suivie d'un mini test de 3 exercices, pour permettre aux apprenants de la construction de la connaissance par eux même, en utilisant le domaine de communication hormonale. Un test final nous a permis d'évaluer l'évolution de l'apprentissage des apprenants après notre intervention à distance.

Résultats et discussion:

Au plan des difficultés reliées au raisonnement scientifique, notre dispositif d'accompagnement à distance a révélé une nette amélioration dans le niveau des questions d'analyse et d'interprétation, malgré la persistance de quelques lacunes chez un nombre réduit des apprenants. En effet, le pourcentage de réponses correctes à la question d'analyse de l'expérience est passé de 50% à 92.85%. Pareillement le pourcentage de réponses exactes à la question d'interprétation est passé de 21.43% à 71.42%.

Au plan des erreurs relatives au concept de « la communication hormonale », nous avons remarqué que plusieurs types d'erreurs ont été dépassés. Parmi ces erreurs, nous pouvons citer : « la communication hormonale se fait par voie sanguine », « le dysfonctionnement de la thyroïde». Les acquis concernant la distinction entre hyperthyroïdie et hypothyroïdie ont été également renforcés. D'autre part, la comparaison des moyennes de notes obtenues avant et après l'intervention a montré une différence évidente (13.78/20 au pré-test pour 15.21/20 au post-test) L'analyse statistique montre que la différence constatée est significative (valeur de signification égale à 0.001 inférieure à 0.05 ; test de student). Ces résultats montrent bien que notre intervention à distance a eu un impact positif sur le dépassement de certaines difficultés et sur l'amélioration du rendement traduit par les moyennes obtenues par les apprenants aux tests en question.

Les différentes activités proposées à distance aux apprenants, les ont aidé à consolider certaines notions relatives à la communication hormonale, elles les ont principalement permis de surmonter des difficultés au niveau du domaine de raisonnement scientifique (analyse, interprétation) malgré la persistance de certaines lacunes. Ces résultats sont cohérents avec ceux d'une étude faite au Maroc en 2012 à propos l'utilisation d'une plate-forme dans la régulation des apprentissages et l'accompagnement des élèves en SVT et des recherches réalisées par Karsenti et Ngamo en Afrique (2007) et Lamarque (2008-2009) en France, qui témoignent de l'effet positif de l'utilisation des technologies de l'information et de la communication pour l'enseignement de la SVT au Sénégal et en France respectivement. Les résultats de notre recherche rejoignent, en partie, ceux d'une étude faite au Liban pour voir l'efficacité de l'accompagnement à distance par rapport à l'accompagnement en présentiel dans le dépassement des erreurs des élèves de la troisième, dans le chapitre de la génétique (Nahed, Bazane, El Hage, 2014) et ceux de l'étude faite à l'université de Leicester (2010) au niveau de l'usage des réseaux sociaux qui montrent l'intérêt des médias sociaux et à la mise en partage et de réflexion entre enseignants et apprenants. D'autre part nos résultats ne rejoignent pas ceux de l'étude faite à l'université Ohio State en 2010 qui montrent une dispersion de l'attention des apprenants à la suite de la fréquence régulière de Facebook qui serait l'une des principales causes de la faiblesse des résultats. Notre étude ne prétend pas confirmer

l'impact positif de l'accompagnement à distance mais elle ouvre des horizons et constitue un point de départ pour d'autres études qui peuvent être réalisées pour d'autres activités et dans des contextes différents.

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The Effect of Using Problem Based Learning on the Achievement of Secondary Level Students in Probability

Rima Amacha, Ahliah School, Beirut, Lebanon

Teaching probability has been a challenge for many educators at all school level. In other grade levels, mathematics concepts can be easily verified by following arithmetic proofs, algebra, modelling or geometric relation, which is not the case when teaching Probability. This action research proposes a strategy to teach probability concepts and applications. The aim of this study is to highlight the misconceptions in learning the probability concepts, as well as investigates the effect of using Problem Based learning (PBL) in addressing these misconceptions. This study is experimental. A questionnaire, a pretest and a post test were used to assess students' achievement. The proposed strategy was inplemented in grade 11 in a private schools in Beirut and the results were compared to another grade 11 scientific section of the same school. Results were processed using SPSS software. The results suggest that it is possible to improve students' understanding of probability and correct their misconceptions by targeting them through a PBL strategy. It also suggest that using real life examples when preparing activities can improve students' performance in solving probability problems. The session will include a detailed presentation of the flow of this action research. Participants will be discussing and sharing their ideas about the lesson and the proposed strategy. The session will end up by raising new research questions for possible further researches

Keywords: Probability, Problem Based Learning, Misconceptions, Secondary mathematics

The following action research will be presented and discussed with the participants of the session who will be engaged in discussions related to the proposed strategy, the procedure and the reflections. Participants will also discuss any possible further studies that can be conducted on designing a mathematics curriculum based on the Problem Based Learning

Chapter 1: Introduction

Teaching and learning mathematics has always been a challenge for both educators and students. Many educational resources and studies have shown the difficulties that may face the students or the teachers while dealing with mathematics concepts, because these concepts get more and more abstract with each grade level. Some of the basic concepts in math were easily addressed through constructed models and proofs. For example, in teaching addition, a sum of 2+3=5 can be easily verified by combining two items with other three items, even in trigonometry, relationships can be proven by drawing diagrams (Ang, 2014). However, when it comes to random experiments, it becomes more difficult for a teacher to convince students that the occurrence of outcomes can be expected or calculated. Randomness and luck are not as easily explained as they seem to be, and this is what makes probability concepts more challenging.

Probability misconceptions were a major interest of many studies and experiments (Ang, 2014; Khazanov,2010; Talawat, 2015; Gurbuz,2014), yet few articles tried to detect the effect of using real life examples on reducing probability misconceptions. Probability is one of the topics that can be mostly related to real life situations starting with counting techniques until reaching conditional probability in the following grade levels. Ensuring that a student can solve problems about permutations, and arrangements can be a basic step in teaching probability concepts. We propose teaching probability concepts using a Problem Based Learning. This strategy may help students in achieving better results when solving probability problems.

Topic Statement

Students' performance in probability can be affected by many factors such as misconceptions, content, teaching strategy… etc. A weak performance in probability can be linked to possible misconceptions in the students' thinking patterns. The purpose of this study is to detect the presence of possible probability misconceptions and to test the effect of using a Problem Based Learning strategy on reducing these misconceptions and enhancing understanding of Probability problems for 2nd secondary level students in a private school in Beirut.

Significance of the study

Understanding probability concepts is essential due to its wide range of applicability such as probability of side effects of medications, probability of having genetic disorders based on information of one's family... etc. The purpose of this study is to explore the impact of using Problem Based Learning on the progress of secondary level students in probability. Probability was chosen for eleventh grade students (scientific sections) at this level for its influence on many topics that are essential for their success in the Lebanese Baccalaureate such as genetics (life

sciences) and on other math topics such as conditional probability and random variables (general sciences). Besides, it is well known that probability is commonly used in many majors such as pure mathematics, applied mathematics, genetics, risk theory, business management

Research questions:

1. What are the probability misconceptions present in the students' thinking pattern? And how can these misconceptions affect their achievement?
2. Will relating probability to real life situations in a problem based context have a positive influence on reducing the misconceptions as well as improving students' achievement in learning probability?

Theoretical background & Review of related literature

"Students should be able to develop more complex, abstract, and powerful mathematical structures to enable them to solve a broad variety of meaningful real-life problems.

Furthermore, students ought to become autonomous and self-motivated in their mathematical activities such as acquiring mathematical concepts, skills and problem solving; meta-cognitively aware of their mathematical thinking; highly motivated in mathematics learning and develop positive attitudes towards mathematical task." (Tarmizi, 2011)

Problem-based learning may also offer opportunities for learners to develop their critical thinking skills and their reasoning in problem solving especially in multi-step problems. Problem Based Learning can be considered as an educational strategy that combines aspects of different learning styles such as Information-processing theory, cooperative learning, constructivist learning, and contextual learning theory. (Tarmizi,2011)

Students, who are engaged in problem solving activities, are building their reasoning skills automatically; when solving a word problem, they feel free to express their understanding of the problem in any possible way (tree diagrams, schema, sketches, maps…) far from being bounded by a procedural method. This freedom can widen their perspectives and reflections on a same problem and therefore will develop their reasoning skills. A student uses reasoning skills at the following stages in the process of problem solving: - when trying to decode and understand the given problem, - when establishing connections between concepts related to the problem and previous knowledge, - when making conjectures and generalization based on thinking patterns, and - trying to prove conjectures as an outcome for the whole process. (Napitupulu, 2016)

Some of the common misconceptions that were spotted in students learning probability and discussed by several educators and researchers can be grouped under two different titles: Understanding probability concepts/ calculating probabilities

Representativeness: this misconception arises from the understanding of the randomness of the experiment or the situation. In a situation in which students are asked to consider a random selection of a sample from a given space, it seems that students think that the selection is more likely to be a collection of random elements of the whole space and is similarly less likely to be a collection of elements of the space given in a pattern

Equiprobability bias: Students with this misconception tend to assume that random events are equally probable by nature. Or in other words, they view the chances of getting different outcomes as equally likely events

Conjunction fallacy misconception: students with this misconception tend to think that the probability of an event E is higher than the probability of an event F where E is included in F. For example, if you bring seeds from a flower shop and you plant them, a student with this misconception thinks that the probability that flowers will grow out from the seeds is higher than the probability that plants will grow. What's more specific tends to be more probable.

Calculating probability: Misconceptions under this title are detected with students who show understanding of the probability concepts but still do probability problem incorrectly. Such misconceptions are detected when the student fails to choose the suitable rule for a given situation Following are probability concepts with their respective percentages of ranking among the hardest three based on a research conducted by Khazanov and Gourgey in 2009

Bayes's Theorem (66%) and Conditional probability (60%)

Independent and mutually exclusive events (55%):

Counting, Permutations and Combinations (42%):

Chapter 2: Methodology

Design and participants: The previously mentioned research questions will be answered and tested through an action research with an experimental study where the participants are students in two different sections of 11^{th} graders (scientific section) in a same school. First section will learn probability in a traditional way, while the second section will learn the same objective through activities that trigger their problem solving skills using the problem based learning and the selected problems will all be related to real life situations.

Instruments: The study tests the achievement of grade 11 students after an experiment concerning the teaching strategy according to Problem Based Learning on the students' achievement in probability. All instruments used in this research were pilot tested before the experiment

The instruments used were: 1) a questionnaire made of 5 questions prepared on a likert scale to help the researcher know the learning style of the students.

2) A pretest adopted from a doctoral dissertation from the University of California that aims to detect the presence of misconceptions among the participants.

3) A post-test adopted from the same doctoral dissertation that aims to detect the persistence of the misconceptions after applying the proposed strategy.

Procedure: students were asked to fill in the questionnaires and to answer the questions of the pretest. And then students were put in groups and started to work on tasks that cover the objectives of the lesson at this grade level along one week: Tasks were related directly to real life situations that face students of the same age group of the participants. One task covered the following situations: the section chosen in grade 12 (Economics, life sciences or general sciences) which have been known to be a major concern of grade 11 students. Another task covered blood types and blood donation: students were asked about random experiments related to blood types

to raise awareness about blood donation or emergency cases related to blood types. A third task was based on data from the Lebanese Army about road accidents. Students were asked to do random experiments based on statistical data taken from the Lebanese Army. Questions were focusing on probability concepts while raising awareness toward cars and motorcycles accidents. Students of the other sections were taking the same objectives in a traditional way
After the tasks were done and discussed, students of the two sections had to sit for a post-test to detect if the proposed strategy helped in improving the students' performance and reducing their misconceptions.

Results and analysis
Data taken from this study was processed used SPSS software

A T-test was used to compare the school's records of the two sections to show if they have the same level in mathematics and it gave a value of 0.204 which tells that the two classes are of a same distribution

A T-Test was used to compare the students' pretest results to ensure that the misconceptions were present homogeneously in the two sections (0.865)

The results of the post-test were as follows: a mean of 63.63% in the section taught using the proposed strategy and 46.24% in the section taught in a traditional method.

A T-test used to compare the posttest results and gave a value of 0.0022 which tells that the difference in the results is less likely to happen by chance.

Conclusion: Students in secondary classes often learn math topics in a traditional way. This thesis aimed to examine the effectiveness of using a Problem Based Learning strategy in teaching Probability. The obtained results showed that the tested strategy has a significant influence on the students' achievement. A question rises; will this strategy be as effective when teaching other math topics? Can this strategy be applied in other levels? What distinguished the Problem Based Learning from traditional strategies, in addition to being based on the constructivism theory which ensures a high level of involvement of the student in the learning process, is its direct relation with real life situations and applications which makes it a powerful tool to make students more familiar with math concepts.

Problem based learning and its wide range of applicability in instructional practices can be discussed with their extensions to other mathematics concepts. In addition to possible practices that can integrate technology in a problem based context which triggers the students' visual intelligence and enhance their critical thinking skills while looking for solutions of the given problems.

The detailed research thesis is available upon request

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Using Smartphone Efficiently During Math Lecture

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Teachers are always frustrated with students and their use of cell phones during classroom. Texting, tweeting, and snap chatting during in class are an incredible distraction, resulting in a difficult teaching environment. In this paper, we propose an innovative approach to encourage students to use effectively their Smartphone in Math classroom. The main idea behind this is to develop an easy and friendly mobile application related to the Differential Equation course that may be accompanied by the used textbook and to supplement it. The proposed application can be adapted easily to any textbook with different subject, where no coding is required. The usefulness of our proposed technique is shown in the survey analysis.

Keywords— teaching mathematics; classroom; higher education; mobile learning; application;dale's cone, blooms taxonomy, samr model.

INTRODUCTION

A recent study done in Toronto District School showed that more than 95% of the university students possess smartphones. However, many complains were done by teachers about the use of cellphones in classroom [1]. Texting, tweeting, posting blogs and snap chatting during class time are considered to be a major source of incredible distraction, making it difficult for educators to deliver and teach their prepared materials. It is pretty hard to compete with a very funny YouTube video as most people agree on. It is considered to be the most vexing issue of the digital age for teachers and administrators [1] [21]. Many debates where done regarding actions being taken with students' cell phones. Some agree on maintaining smartphones and other electronic devices in schools as a crucial competitive tool in a global market, while others insist that these devices distract students, compromising their learning time and focus (figure1) [2]. In both cases, the problem using cellphones in class remains a major issue and is rapidly increasing, therefore educators must find a way to deal with this situation and need to find an appropriate solution for both parties [2] [3].

Fig1: Using smartphones and other electronic devices in schools (adopted from google images [23])

LITERATURE REVIEW

For the past decade or two, many mobile devices ranging from laptops, e-book readers, tablets and smartphones are considered to be important tools in the educational sector. Using both wireless communications and portable powerful devices, a new learning tool was developed promoting both vast effective information and innovation of education to the traditional classrooms [4] [5]. Mobile technology plays an essential role in creating new cooperative learning methods, self-exploratory learning outside the classroom and facilitating the development of communication, problem-solving and increasing academic performance among students [2] [3] [6].

A large number of educational institutions are now implementing the use of supplemental courses via smart devices and automated systems. This facilitates students in grasping more knowledge using their favorite electronic mobile device tool. Adapting many educational software by universities in their teaching programs, many software markets and mobile applications have increased rapidly supporting operating systems (OS) that are installed on mobile devices [7] [22]. Students are now capable of managing their study time by grasping updated e-books and online prerequisite materials using android, iOS and window mobile smartphones running on OS, making learning more flexible and time efficient [8]. Many advantages come with the use of mobile learning that can be summarized by the following points such as instant updates of course-related materials; reducing cost distribution and time marketing of old-version textbooks with instant updated online courses using Wi-Fi and cellular connectivity; flexibility in learning with no limitation to time or place; showing more interest in reading handy educational contexts versus occasional learning; time management and effectiveness during online quizzes and assessments [9].

Therefore, mobile technology using mobile applications have shown great potentials in facilitating and innovating educational methods, aiding educators to develop new ways of communications and advanced skill methods to effectively increase higher thinking levels for students in class and also off campus [10].

METHODOLOGY

In this study we propose a textbook supplemental mobile learning application as a student resource that can be downloaded using a student's account. Math courses include many abstract topics in which many students usually struggle to understand them. The proposed application in math courses is capable of delivering the abstract topics in an active learning environment, making the course more dynamic and time productive for the users. Our research demonstrates an innovative learning approach by developing a simple mobile application designated to serve the specified course that is accompanied by a math textbook. This application encourages students in using their mobile phone in class with effective learning outcomes. Moreover, the proposed application has the ability to be implemented in many textbooks where the instructor does not need any coding requirements or IT special skills other than the easy MIT app inventor. It integrates math topics with mobile software platform that can be accessed by students registered in math course offered by the university. This application serves the students as a study guide tool during their studies by understanding various scientific concepts that can be illustrated using live images, videos and online quizzes, instant feedback during the lecture. Another aspect of this application is its ability to deliver instant updates about student evaluations and monitor their feedback. It serves educators to frequently guide and motivates students by improving their performance.

Several studies focused on integrating mobile devices using applications of various types with teaching and education at universities to assist constructive learning by educators [11]. In this study, we will be focusing on how knowledge and informative education can be controlled and delivered by educators using mobile applications as a sort of reinforcement tool that help in motivating, strengthening classroom engagement and assisting constructive learning.

APPLICATION

This paper proposes a supplemental mobile application for mathematics based students, capable of delivering the fundamental and essential mathematics and formula concepts. It integrates basic knowledge with mobile software platform that can be accessed by students registered for specified math course offered by the university. This application serves the students (users) as a study guide tool during their studies by understanding various scientific concepts that can be illustrated using live images, equations, formulas, videos and online quizzes. Recent studies have shown that mobile learning applications have highlighted important insights on the students' ability to enhance their learning to various stages and attempt many online tutorials and quizzes for self-assessments. Another aspect of this application is its ability to deliver instant updates about student evaluations and monitor their feedback. It serves educators to frequently guide and motivates students by improving their performance. Any new teaching methodology needs to be categorized by using Dale cone and Bloom's digital taxonomy frameworks since both of these frameworks have

demonstrated effective teaching and learning outcomes over the past years. Both frameworks have shown classification of learning methods and corresponding retention rates via Dale cone framework and categorization of thinking skills via Bloom's digital taxonomy. In addition to these frameworks, another model is introduced in the online educational field known as SAMR, transforming learning experiences designed by educators to have a significant impact on students' outcome. Using both Bloom's digital taxonomy framework as well as SAMR model, cognitive skills are better targeted and aids in moving from traditional teaching tasks to student-centered mobile technology-integrated learning.

In conclusion, designing online assessments, tasks using mobile technology is indeed considered to be a key challenge for the instructor, encouraging more frequent use of learning technology as opposed to traditional teaching.

CASE STUDY

A textbook supplemental mobile learning application can be downloaded using a student account offered by the university's website. This application focuses on supplementing additional online formative assessments including basic mathematical concepts, figures and online questions and student feedback. These features are accessed using a mobile smart phone device with Wi-Fi or cellular connectivity by logging into a student account. The courses designed in this application focuses on delivering basic mathematical concepts. The knowledge is gained deductively since this type of field lacks experimental learning models and therefore grasping the information is poorly established. Due to the continuous student demands for problem solving and tutorial sessions to assists them in the studying process, this applications uses online quizzes helping the users to self-assess their knowledge and receive instant feedback throughout the course, enabling more efficient in-class interactions with flexibility in learning. The application therefore has the ability to enhance prerequisite materials and enable more efficient in-class interactions with flexibility in learning. Our application using MIT (Massachusetts Institute of Technology) App Inventor 2 version 2.39. The mobile educational application platforms are shown in figures 2 to 10. A survey analysis will be shown during the session on the students' opinion and performance using the new mobile app.

SAMR MODEL

The "Substitution Augmentation Modification Redefinition Model" known as "SAMR" is a new technological method that was introduced recently in the educational field. This framework was developed by Dr. Ruben Puentedura back in 2006 to help educators infuse technology into teaching and learning environment, and transforming learning opportunities as a result in higher academic achievements for students [20].

SAMR model serves in monitoring both progression of educational faculty members as they implement the use of technology in their teaching skills and how this technology impacts learning/teaching outcomes. Therefore, the goal behind these three models is to design and incorporate digital learning based on technology frameworks, resulting in a higher level of achievements for educators and students.

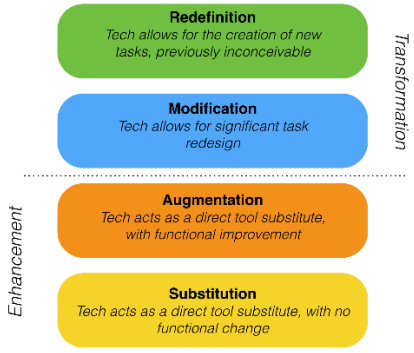


Fig. 2: Classification of both frameworks show classification of learning methods and corresponding retention

Any new teaching methodology needs to be categorized by using Dale cone and Bloom's digital taxonomy frameworks since both of these frameworks have demonstrated effective teaching and learning outcomes over the past years. Both frameworks have shown classification of learning methods and corresponding retention rates via Dale cone framework and categorization of thinking skills via Bloom's digital taxonomy (figure 2). The designed mobile

application is inspired from SAMR model where our suggested teaching method falls in the "participation level" in the Dale's cone level and in the "Applying / Evaluating" in the Bloom's level (figure 3).

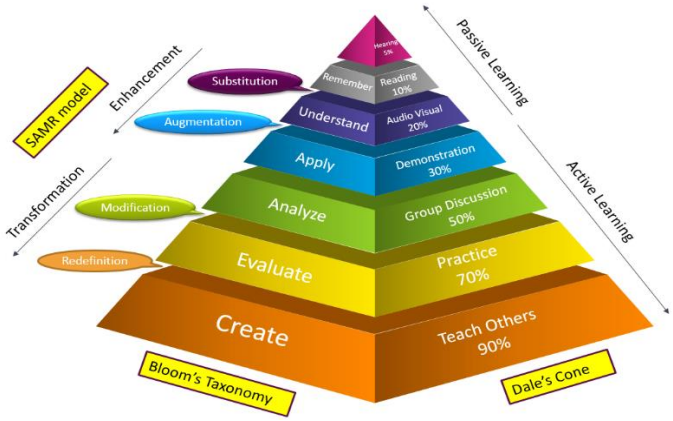


Fig. 3: SAMR model

Table 2 shows the situation of our new learning method with respect to: Bloom's Taxonomy, Dale's Cone of Experience, and SAMR model:

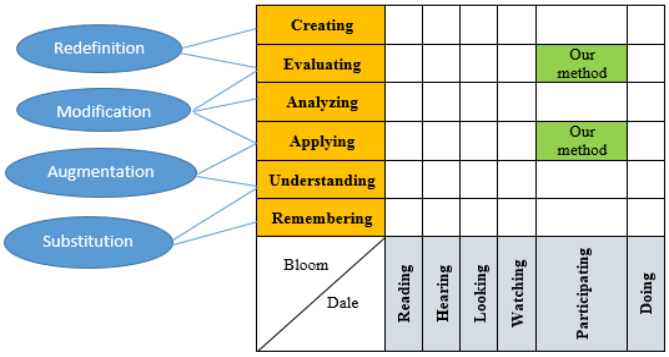
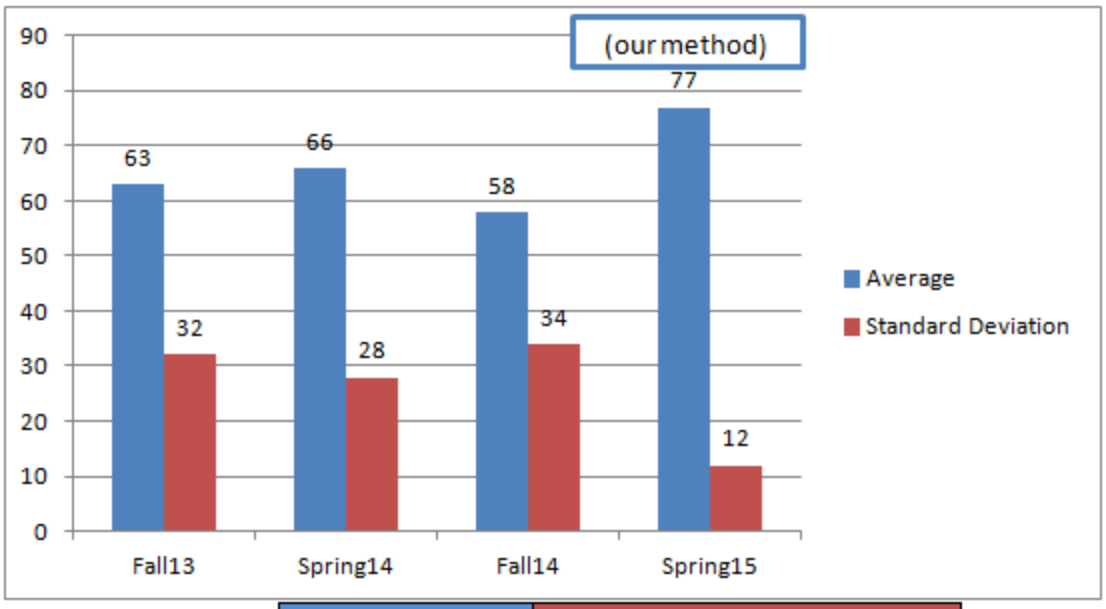


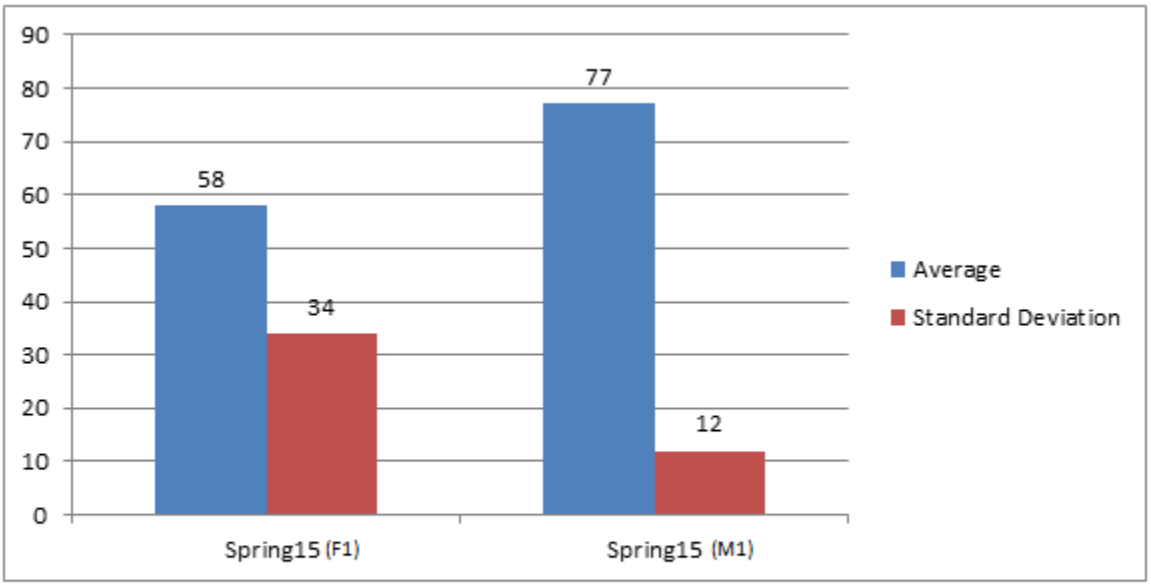
Table 2: Our method in Bloom's Taxonomy, Dale's Cone of Experience, and SAMR model

EXPERIMENTAL RESULT

In this section, we will compare the result of an assessment in terms of average grades and variance with previous years and with the same year of other section that I taught using traditional teaching methodology.



	Average	Standard Deviation
Fall13	63	32
Spring14	66	28
Fall14	58	34
Spring15	77	12



	Average	Standard Deviation
Spring15(F1)	65	29
Spring15(M1)	77	12

As we can see from the previous figures, the result of our method is better than traditional way of lecturing. The average is higher and the standard deviation is the lowest, and basically this was our purpose to maximize the mean of grades and to minimize the standard deviation among students' knowledge.

The improvement of our method can be supported by studying the significant statistical test and the students' feedback from the small survey conducted at the end of the lecture.
As we notice the class average was improved but to say that with confident we need to statistically study the significant of our method through the T-Score test. For instance, the significant test between Spring2015 and Fall2014 is:

$$SE_{SP15} = \frac{sandarddeviation}{total\ number\ of\ \ students} = \frac{12}{\sqrt{30}} = 2.19$$

$$SE_{FA14} = \frac{sandarddeviation}{total\ number\ of\ \ students} = \frac{34}{\sqrt{30}} = 6.2$$

$$SE = \sqrt{2.19^2 + 6.2^2} = 6.57$$

$$t = \frac{77 - 58}{6.57} = 2.89$$

$$df = 29$$

The P-value is 0.00722 < 0.05. The result is significant.

Students' feedback and observation:

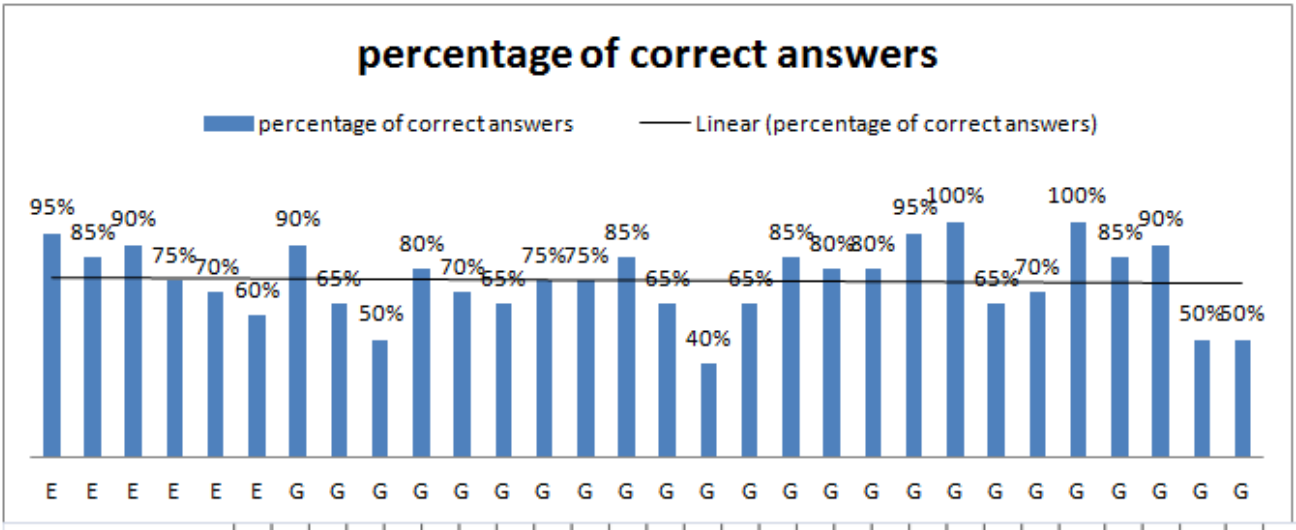
- 85% of the students found the method interesting, ass more fun and engagement, and ask to apply it again in other assessment
- ...
- ...

Students' learning retention analysis

In this section we will examine the students' retention from learning perspective of our proposed method. The difference between learning and retention is summarized in the below table:

Learning	Retention
- Involves brain, nervous system, and environment - Can learn something for a few minutes and then lost it.	- Process by which long term memory preserves learning so that it can locate, identify and retrieve it in the future.

To measure the retention of materials percentage, we conduct a pop quiz on the topics given in our experience after two weeks. We ask students to write down the steps that they remember to solve exact differential equation (same topics learned in our proposed method). The chart below shows the result (fig. 10):



stdudent#	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
student type	E	E	E	E	E	E	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
percentage of correct answers	95%	85%	90%	75%	70%	60%	90%	65%	50%	80%	70%	65%	75%	75%	85%	65%	40%	65%	85%	80%	80%	95%	100%	65%	70%	100%	85%	90%	50%	50%

The average rate of material retention after two weeks of the activity of our proposed method is 75%. The same pop quiz conducted on my second class where the lecture-based method is used gave 55% of the student retention.

CONCLUSION

This proposed study shows a new supplemental teaching method that helps in supporting a mathematic textbook during an undergraduate program. Designing the application by an instructor does not rely on any technical skills or any prior programing knowledge. This paper shows the benefits of our teaching methodology which is illustrated by three well-documented education evaluation models: Bloom, Dale, and SAMR. More work and surveys will be performed inside and outside classes using this designed application for math and other undergraduate courses. Student's performance using our new teaching methodology application will also be examined and analyzed before and after the use of our designed supplemental application guide.

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The Road to Active STEM Learning

Amin Tawil & Bassam Itani, Makassed Omar Bin Al Khattab, Beirut, Lebanon

Science, technology, engineering, and mathematics (STEM) education is a crucial issue in current educational trends. Research shows that integrative approaches improve students' interest and learning in STEM. STEM learning experiences prepare students for the global economy of the 21st century and students need a solid STEM knowledge to become ready for college and employment.

In our presentation, we will focus on the **importance of adopting STEM education in Schools** and our experience at **Omar Bin Al Khattab School** will lighten the road to active STEM learning.

Topics discussed:

1- How to improve students' performance and motivation in any subject.
2- Strengthening teacher training and professional development in STEM.
3- Encourage students to choose STEM careers.
4- Increase the participation of women in STEM careers.
5- Invite STEM professionals or university students into schools to work with teachers and students.
6- Allow teachers and students to visit STEM work places.
7- Visit our STEM classes at OBK and share our experience in Lebanon.
8- Ask the ministry of Education to provide Lebanese Schools with the necessary kits and teacher training to start adopting and teaching STEM curriculum.

Teaching STEM is a new successful experience at our school and in my presentation I will show you the results of our experience and encourage other schools to adopt STEM education in their curriculum.
The session timeline is summarized by:

10 min - Start by introducing the evolution and importance of STEM education in the 21st century.
10 min - Showing that the quality of teaching has the largest impact on the improvement of students' performance and motivation in any subject presenting results from all over the world and from our school.
10 min - Showing video and reports of our teacher's training workshop at LITTLE ENGINEER and the used KITS for that purpose.
10 min - Showing STEM careers in Lebanon and worldwide.
10 min - Encouraging females to take STEM education and careers by giving examples from our school and from other schools worldwide and by inviting STEM professionals or university students into schools.
10 min - Show our visits to STEM classes and watch the students working with the kits.
10 min - Show our visits to work places and watch professionals at work.
05 min - Ending session by asking the ministry of education to support STEM education and provide schools with the necessary funding and kits to adopt this type of education in Lebanese schools.

Developmental Workshops

Applying Mathematics in the Real World
Amin Dinnawi, Thamer International School, Saudi Arabia
Hasan Dinnawi, Eastwood International School, Mansourieh, Lebanon
The aim of this workshop is to share and investigate several real-life applications of Mathematics. Shifting paradigms from traditional ways of teaching to interactive and collaborative inquiry-based activities is easier said than done. This workshop provides a variety of sample mathematical real-life problems and teaching ideas to solve them. It also models the role of the teacher as a facilitator of the knowledge in the Math classroom. Students need to develop problem solving skills, and therefore these problems need to be meaningful to them in order to get them motivated to find the solution(s). This workshop will engage the participants in inquiry activities where they have to solve problems in real life contexts collaboratively just like it would happen in a real Mathematics classroom. It also depicts the ways in which students construct their own knowledge, invent their own strategies and create novel solutions to problems as well as test their validity in the real life context. In addition to that, we will also be sharing some interesting facts and paradoxes in Mathematics. Finally, technology is an important aspect that should not be neglected in Mathematics classroom, so we will be sharing several free online technological tools that can be useful to Mathematics teachers

Introduction:

How many times have your students asked "When are we ever going to use this in real life?" You'll find ways to answer such questions here!
Through the years, and probably through the centuries, teachers have struggled to make math meaningful by providing students with problems and examples demonstrating its applications in everyday life.

Math is more than a set of problems in a text book. In this workshop we will be sharing some logical derivations and ideas that serve as a projection of math into our real world. Linking mathematics to the real world enhanced students' understanding and motivation to learn this discipline. At the same time, showing students meaningful connections between what they learn and real life gives them a colorful meaning and perspective to mathematics.

We will also be sharing some interesting facts and paradoxes in Mathematics facts and theories that are considered controversial in mathematics.

Strategy:

- Inquiry into Pi:
  Investigating the origins of Pi, discovering Pi in the classroom and introducing various facts related to it. Pi as a link between Mathematics and art.

- Aristotle's discovery of the circumference and area of the Earth.
- Lost at sea investigation (a real life application to coordinate Geometry).

    - ❖ Using coordinate Geometry
    - ❖ Using ruler, pencil, a Map and trigonometry
    - ❖ Reflection on the connection with real life aspects of the task.

- Controversies in Mathematics (the importance of addressing them in class).

    - ❖ Recurring decimals.
    - ❖ The Birthday Paradox

- Word problems:
    - ❖ Why are they important?
    - ❖ Activity 1: Generalization from a figure
    - ❖ Activity 2: Balancing Equations
    - Some Critical Thinking Ideas

    - Questioning styles

Description of the session:
The participants will be sitting in groups of four or five.

- The workshop will start with an introduction stating the purpose of the workshop and the importance of problem solving in Mathematics (5 min.)

- Activity 1: Inquiry into Pi (10 min.)
- Activity 2: Aristotle's discovery of the circumference and area of the Earth. (15 min.)
- Activity 3: Lost at sea investigation (a real life application to coordinate Geometry). (20 min.)
- Activity 4: Controversies in Mathematics (the importance of addressing them in class):

    - ❖ Recurring decimals. (7 min)
    - ❖ The Birthday Paradox (15 min)
- Activity 5: Word problems
    - ❖ Importance (5 min.)
    - ❖ Activity 1 (5 min.)
    - ❖ Activity 2 (5 min)
        - Activity 6: Some Critical Thinking Ideas (20 min)
- Closing. (5 min.)
- Time for questions. (5 min.)
- Time for completing the evaluation sheet. (3 min.)

Several resources from this workshop can be sent via email for the participants who request it.

Motivate to Innovate

Fouad Bakkar, Amjad High School, National Protestant College, Lebanon

Don't hesitate, it's your right to estimate; Multi-demonstrations by simple combinations; A lottery tool in my gene pool are three different hands-on activities that will employ various materials in an innovative manner to demonstrate various concepts we teach in science or math. Estimations would have never been of fun as using an irregular quadrilateral to estimate the sides' length and to realize the margin of error with subsequent trials. Rubber bands used in constructing different quadrilaterals would visualize through models the properties of diagonals. Using a lottery tool, rotating wheels would visualize the manner of inheriting alleles and calculating the probability of their inheritance. Participants in this "innovative idea" session will be exposed to the reliability of tens of concrete materials in practical teaching and how their usage in class would add a value for the teaching session. In brief, the diversification of teaching strategies motivates students for learning on the short run and for innovation on the long run.

C1. Introduction: As a Biology teacher for the past 26 years in my career, I have found out that teaching science at any level and particularly Biology must take into consideration the learner role. This role can be highlighted when the learner, he or she becomes an effective part in the teaching strategy where the science process skills and concrete materials fuse together to elaborate better learning outcome of the teaching session. This is why I have considered the usage of concrete

materials in class, simple household materials, dominoes, playing cards and much more, the elements of a valuable recipe for better learning outcome. In this sense, teaching synchronized with frequent usage of such elements has a greater impact on students learning whose feedback is direct and serves the ultimate goal of our career education and long life learning.

2. Strategy: Students in real life situations fail to estimate true and exact dimensions of objects and as function of time, coming up with wrong answers hinders them even from going to any further trial. This session will first introduce the participants to the significant importance of estimation that students can engage through using a wooden piece and some mathematical operations. Second, teaching properties of diagonals in quadrilaterals would be of more fun for students and especially for those seeking kinesthetic learning. Three- dimensional demonstrations will enable students to practice different quadrilaterals construction and figure out the properties of their diagonals. Third, the probability of inheriting a specific allele from either parent and calculating such probabilities at different loci would be highly integrated through using a lottery tool. In this part, using a number of wheels on a given axis will help students building up concrete knowledge about probabilities and its usage in real life.

3. Description of the session :

Part 1: Don’t hesitate, it’s your right to estimate.

The activity aims at practicing estimation. This session will introduce the participants to the significance of estimations in our lives. The participants will be engaged in teams at estimating the length of 6 sides of an irregular quadrilateral. Data will be recorded. The participants would use later a measurement tool to determine the actual size of the 6 sides. The difference between the estimated and measured ones is calculated. The differences collected from the members of each team would be plotted on a graph whose ordinate would reflect this difference whether being negative or positive. The outcome of the plotted data would reveal the significant deviation of the differences and their tendency to decrease as a function of the successive trials.

Part 2: Multi demonstrations by simple combinations

The second demonstration would concretize the properties of diagonals through constructing different aspects of quadrilaterals. Using a 50cmx 50 cm wooden grid whose surface has been concretized by colored pins, the participants would be requested to use rubber bands to construct all possible types of quadrilaterals: the square, rectangle, trapezoid, rhombus and the parallelogram. Using other type of colored rubber band the participants would set the diagonals

of each constructed quadrilateral. The properties of the diagonals whether being bisecting, equal or perpendicular would be recorded in a table.

Part 3: A lottery tool in my gene pool.

This section would highlight the analogy that exists between the lottery tool and the inheritance of alleles in someone's genome. To visualize this concept, coins and dice are used first to demonstrate basic fractions. Participants will be engaged next in the activity based on a system of wheels rotating around an axis. In this sense, data collected from rotating wheels individually and later collectively are projected to human scale to calculate the probability of inheriting two alleles in the case of one gene, two genes or more such as the genes of major histocompatibility complex. Discussion of data would help participants to realize the lottery aspect in inheriting alleles and how the probability of inheriting several factors at one time becomes very low.

4. Conclusion:

The set of these activities would enable the participants as science and math teachers to realize the significant importance of using concrete materials in classrooms and how to integrate such materials in biology or math classes. In this sense, the acquisition of such concepts becomes guaranteed and the global objectives from teaching are accomplished when bridging learning objectives with the adequate materials and the proper time of its usage. These activities have been on one hand the expression of my own experience in teaching and innovating new strategies for teaching and on the other hand motivating many of my students and inspiring them to innovate and generate projects such as innovative models, scientific researches and being patent holders.

Could Team-Based Learning (TBL) increase the motivation of students and their achievement in Science Classes?

Christiane Jarjoura, Saint Joseph School, Cornet Chehwan, Lebanon

Team-Based Learning (TBL) is a form of collaborative learning that includes individual student work followed by collaborative work. In this learning strategy, students are initially required to read material at home using a reading guide, and are then tested in class on their comprehension of the information read, first individually and then collaboratively. Finally, students collaboratively apply the information learned while solving real-world application activities. To apply TBL, changes to the traditional classroom setting are required and guiding principles are to be followed. Thus, TBL could enhance students' communication skills and motivate them into obtaining better academic results by engaging them in interactive, mind stimulating, and fun activities.

1. Introduction

Even though we believe that teachers' professional development has a great impact on students' achievement, we also believe that the way in which students interact with each other as they learn may have greater impact on their achievement than do curriculum programs or teacher behaviors (Humphreys, Johnson, & Johnson, 1982). Ideally, in every classroom, all students should work collaboratively with each other, compete for fun and work autonomously on their own (Johnson, Johnson, & Holubec, 1994a).

Cooperative learning is more complex than other methods of instruction since it involves both engagement to task work and to teamwork, and it could be used when the learning objectives are highly significant, retention and mastery are essential, problem-solving is desired, creativity is expected and higher levels of cognitive abilities are needed (Johnson, Johnson, & Holubec, 1994b). Studies show that students can, with help from others who are more advanced, master concepts and ideas that they cannot understand on their own; thus perform better using collaborative work (Slavin, 1990).

Team-based learning (TBL) is a form of collaborative learning that includes individual student work followed by collaborative work. In this learning strategy, students are initially required to read material at home using a reading guide, and are then tested in class on their comprehension of the information read first individually and then collaboratively. Finally, students collaboratively apply the information learned while solving real-world application activities. Thus, TBL is shown to enhance students'communication skills and to motivate them, especially low-achievers, into obtaining better academic results (Jarjoura, Abou Tayeh, & Zgheib, 2014).

In Lebanon, most students take a full load of several courses in parallel. This congestion has forced most of them to adopt a studying style that is passive, test-focused and crammed rather than smooth and continuous. In addition, students today seem to prefer entertainment and socialization over challenges to learn. To study, they rely on their short-term memory that does not encourage deep understanding of the material and that leads to quick forgetfulness of the information. Moreover, most of the time, students in science classes do not come to class prepared and rarely read the book material and hence are unable to communicate their ideas using accurate scientific terminology. This situation discourages teachers who try their best to deliver knowledge and skills. Hence, teaching science in more active, mind-stimulating and fun strategies should be a priority for any teacher, thus, our choice of the topic of this session.

2. Strategy

- Indicate the objectives of TBL
- Demonstrate the principles of TBL
- Design successful TBL sessions
- Present some of the researcher's TBL experiences with school and university students

3. Description of the developmental workshop session

- 30 minutes: An interactive discussion will be conducted during which the participants will have a clear understanding of TBL, its objectives, principles and requirements
- 60 minutes: A Hands-on TBL activity will be performed in which participants will take the role of learners and be engaged in an actual TBL session

1. Participants will be divided into teams of 5 members each
2. Participants will start by individually reading an article
3. Participants will answer an assessment test first individually, and then in teams (The questions will assess their knowledge of the material read)
4. The presenter will give feedback on the assessment test
5. Participants will perform an application activity in teams (The questions will assess their analysis and interpretation of the material read)
6. The presenter will give feedback on the application activity

- 15 minutes: An interactive discussion will be conducted during which the participants will learn how to design successful TBL sessions
- 10 minutes: The presenter will share some personal TBL experiences with school as well as with university students
- 5 minutes: The presenter will distribute some reference material

4. Conclusion

Using TBL in science teaching classrooms would seem to be a natural outgrowth of the way science is practiced in the world outside the classroom; however, it hasn't been accomplished seriously yet. Three main reasons could be that: first teachers need to understand and be convinced of the essence of scientific collaboration and scientific inquiry; Next, expertise is needed to learn how to structure successful TBL sessions; Finally, students are not used to relate to their classmates in ways appropriate for mutual understanding.

Hence, at the end of the workshop, participants would acquire enough knowledge and skills to apply TBL in their classes to motivate and engage their students into achieving better academic results.

5. Reference Material

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Training Today's Students to Achieve Success in the Future

Dounia Sawan & Israa Fawaz, Makassed- Houssam Eddine Hariri High School, Saida, Lebanon.

Under the theme of "STEM", this workshop will tackle the topic of how schools are shifting towards integrating technology by applying project-based learning (PBL), inquiry-based learning and other learning strategies as a way of increasing engagement and creativity in the classroom. This is to be achieved by applying various learning strategies that engage students in deep-level meaningful, long-term activities that shape the aspired learning experience.

It is a students' lead project where teachers only guide. This workshop is going to show how students lead their own learning experience that reflects deep understanding and analysis skills with the integration of innovative and creative learning moments and processes that will enhance a clear connection between core subjects (inter-disciplinary) and real life (authentic experiences). Thus, mathematics makes a lot more sense when it is applied to real situations.

From the beginning till the end of the session, participants will be actively involved in interesting hands-on activities that enrich their understanding of creative thinking to develop the conceptual knowledge of many concepts in mathematics and its usages in other core subjects to eventually equip them with 21st century skills and meaningful experiences. This workshop will expose participants to already designed and applied example of PBL with evidence and handouts.

Making a difference in the world: Approaches to STEM Education.

Fawzieh Hnaini & Nour El-Akhdar, Al-Makassed Dawha School, Saida, Lebanon

In the 21st century, scientific and technological innovations have become increasingly important as we face the benefits and challenges of both globalization and a knowledge-based economy. In order to succeed in this new information-based and highly technological society, students need to develop their capabilities in STEM to levels much beyond what was considered acceptable in the past. We believe that young children with a strong foundation in science, technology, engineering and mathematics will go on to play an integral role in our nation's global competitiveness and economic stability, moreover teaching STEM in elementary grades opens the door for teachers and students to become tomorrow's movers and shakers. So, in this workshop we aim to stress on the importance of integrating STEM in our curriculum and its effects on the quality of the students we'll get in the future. We will apply some STEM activities and compare the results with non-STEM activities thus highlighting the importance of using STEM activities to attain student's conceptual understanding we seek to

Introduction:

STEM pervades every part of our lives where Science is everywhere in the world around us, Technology is continuously expanding into every aspect of our lives, Engineering is the basic designs of roads and bridges, but also tackles the challenges of changing global weather and environmentally-friendly changes to our home and finally Mathematics is in every occupation,

every activity we do in our lives. Teaching STEM in elementary grades opens the door for teachers and students to become tomorrow's movers and shakers.

2. Strategy:

This workshop will use a presentation to get ideas through and a group of activities that will help the audience apply the different ideas. The activities will mostly depend on collaborative work and group discussions that will target both inductive and deductive reasoning.

3. Description of session:

Participants start with an ice breaking activity (M & M 's Ice Breaker Activity) and then the sequence of activities will be as follows:

a) STEM vs. Non-STEM activity:
   - The participants will be working in groups where they will make a non-STEM activity about the steps of digestion
   - Then the participants will make a STEM activity about the same concept
   - Discuss the difference between STEM and non-STEM activity.
   - Discuss the importance of applying STEM in education.
   - Deduce the great effects of using STEM in developing logical thinkers, effective communicators and technological, scientific, and mathematical literate.

b) Introduction:
   - Importance of STEM in our real life
   - Why STEM?
   - What is helping teachers in primary grades acclimate to STEM education?
   - How to integrate STEM in your curriculum?
   - How to Begin a STEM Lesson?

c) Differentiated activity:

   The participants will be divided into 3 groups:
   - Group 1members will make Freddie the fish pollution activity
   - Group 2 members will make Fairy Tale STEM (Rapunzel) Pulley Challenge.
   - Group 3 members will make a Model of the Earth's Structure.

   d) Virtual labs:
   - The participants will work on two virtual labs about forms of energy.
   - Discuss the importance of the virtual labs in engaging students and helping them grasp the concepts.

   e) Geogebra:
   - The participants will use geogebra to apply some geometric concepts.
   - Discuss the importance of the program in simplifying these geometric concepts.

   f) Kahoot:
   - The participants will apply an online assessment (kahoot).
   - Deduce the results to be reached by using kahoot concerning students' engagement and motivation.

g) Innovation kit:

- The participants will work on 2 ready projects made using makey-makey.
- Discuss the importance of technology.

4) Conclusion:

- Effective STEM instruction starts with the teacher.
- The way the teacher plans the activities and the questions to be asked for students can turn an ordinary classroom into a productive STEM learning environment.
- In order for our youth to have the skills that are necessary for living in the 21st century, it is essential that we as teachers plant the seeds today that will make them successful for tomorrow.
- All we have to do is open the door and reach into the sandbox.

5) Reflection:

Looking to the future, what changes would you expect to see in your own teaching and learning if applying STEM?

From Solving Problems to Problem-Solving Model

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STEM-PBL is both challenging and motivating. It requires students to think critically and analytically. Among many other 21st century skills; skills like collaboration, creativity, critical thinking, peer communication, problem-solving, and self-directed learning are part of any STEM-PBL, and will be needed for students to be effective. The essence of an "effective STEM education" is to transform "novice" attitudes and problem solving approaches into "expert". "learning" memorization of facts and problem solving recipes are useful only to pass exam but not to solve problems. Science, Technology, Engineering, and Mathematics (STEM) Project-Based Learning (PBL) integrates engineering design principles with Science, Technology, Engineering, and Mathematics Content. The infusion of design principles enhances real world applicability and helps prepare students for post-secondary education, with an emphasis on making connections to what STEM professionals actually do in their jobs. Participants in this workshop will bring their compartmentalized knowledge of science, technology, and mathematics to bear on solving meaningful real-world problems. Through well designed activities, Participants will apply STEM PBL strategies and build on "engineering design" as the cornerstone and as the foundation on which problems can in solved. the workshops go deeper than just providing examples of projects. It will discuss the process, and empower the participants with project-based learning techniques.

Introduction: STEM education is the process of being scientists, mathematicians, engineers, and technological entrepreneurs. Students in high-level STEM work are actively solving problems, taking ownership of their learning, and applying content in real-world contexts[i]. That's because high-level STEM education is project-based learning; they literally complement each other in the classroom. When working through the PBL, students become more prepared for the real world by working in teams to solve an authentic technological workplace problem where multiple solutions

are possible[ii]. In this workshop, participants will know how to develop PBL in their classrooms, facilitate and act as consultant as student's balance technology, budget and time constraints to devise and test a solution. Participants will also apply the "engineering design process" to come up with solution to a problem, to make connections, design, build, test, evaluate and modify designs to achieve solutions. This process allows students to be actively engaging in critical and creative thinking.

Strategy: The workshop is designed to immerse the participants in progressive activities to help them understand how STEM education and PBL lead to better results in the classrooms. Instructions will be personalized to give every participant an opportunity to test, develop their own ideas, enroll in group argumentations, read and write genres, plan, design and test simple solutions to specific assign problems through PBL.

Description of the session:

I- Ice breaking Activity I: "Let us be the circuits" (40 min.)

- This is to Use the elementary knowledge of resistivity and conductivity, to establish a solution in testing drinkable water upon studying its electrochemistry.
- Participants will use a ready-made lamp to show how conductivity varies from one system to another.
- Activity was designed to start from simple steps (using multi-meters to measure resistivity) to higher order skills (using Arduino board and excel sheet to study the pollution of local fresh water)
- Participants will use a ready-made lamp to show how conductivity varies from one system to another.
- Designed to be accomplished by Groups of three/four.

II- Activity II: "Visualizing the invisible" (40 min.)

- This objective of this activity is to immerse participants in STEM through the "Engineering Process".
- Different Materials and equipment will be given to each group to determine distinct properties of air.
- Groups will present their findings.
- JIGSAW, when completed, will give a comprehensive conclusion about air and its properties.
- Participant will use the knowledge now to plan for a spacecraft to travel from point A (Earth) to point B (Moon) using the "Engineering Process"
- Designed to be accomplished by Groups of three/four.

III- Activity III: "Why we don't think about building a cooper" (40 min.)

- The main objective of this activity is to Use the Problem-Solving Model while as a part of STEM Projects.
- Groups will be able to come up the best cooper design by changing variables and structures.

- The designed flying coopers must be revised and enhanced so that it helps in designing flying robots to understand the "Swarming behavior" of some organisms.
- Participants will watch a video about how robots programed to behave as natural folks while traveling, eating, living…etc.
- Designed to be accomplished by Groups of two/three.

Conclusion: A major consideration when planning projects is catering for the learning needs of all students. Students learn best by making connections, designing, building, testing, evaluating and modifying designs until the project outcomes are achieved. Throughout STEM and PBL process students are actively engaging in critical and creative thinking. They engage in active problem solving by gathering data to inform planning, when they conduct investigations, designing or through the development of prototypes and solutions. They leverage digital technologies throughout the project in communicating findings, solving problems, and assisting with the collation and analysis of data.

Implementing 'Understanding by Design' in STEM Lessons

Nadia Ghader, Sara Mekkaoui, Rayyan Katerji, Lebanese International School, Lebanon.

1. Introduction:

There is a bewildering experience that annoys all teachers: After an excellent classroom experience where students seem solid in their understanding and application of content, they leave class, have no idea how to do their homework, and return the next day with weak or no idea about what they took the day before, and why they took it. Still, the main concern of teachers is to deepen the understanding of students but they lack the expertise or they don't know what is going on and the Lebanese curriculum is discipline-based and topic-based instead of being concept based. Objectives might be irrelevant, tasks and activities imparted during the lesson do not serve the objectives and limited to the huge content that must be completed during a specific time. Designing a well-planned STEM lesson will ensure the deep understanding of the content and the mastery of the required skills. Therefore, there's a need to change how we plan to improve how our learners interact with information and master the required skills. Subsequently, knowledge and skills will be embedded in a student's life and evidenced in succeeding academic undertakings. Using understanding by design is key to initiate this change.

2. Strategy:

Using Understanding by Design's framework (UbD) can help ensure that curriculum, content, and assessment are aligned with the specific outcomes and transferable skills we seek to impart to our students. UbD is a process of backward curriculum design. There are three important stages to backward design planning:

- Identifying the desired outcome
- Determining assessment evidence
- Planning learning experiences and instruction

Stage 1: Identify desired results

Teachers begin with the end in mind: What are the desired results for the lesson, unit, or exercise? Identifying the specific content knowledge or skill set teachers expect from students

helps to narrow focus. In this stage, enduring understandings or principal generalizations that are beyond academic topics are identified, the knowledge needed for competent and professional employees, and the knowledge that is meaningful and lifelong lasting

Identifying the educational priorities of a lesson or unit deliberately narrows content into a manageable stream which involves integration and use of facts or topics as evidence to reach key concepts and principals that are deep and felt learned meanings. “Understandings” and “Essential Questions” help articulate and communicate the educational priorities. This, again, narrows focus and ensures that content is the means, and skill acquisition and transfer are the end.

Stage 2: Determine a method of assessment

In the second step, teachers decide how to assess learning by providing evidence of learners’ understanding and ability to transfer their learning effectively in diverse settings. This assessment goes much deeper to measure a student’s ability to attain those educational goals and exhibit high-level learning. Major assessments should examine several of the six facets of deep understanding identified by UbD:

1. Explanation: where students demonstrate principles and concepts with insight, thoughtfulness, and evidence
2. Interpretation: where students offer powerful and meaningful interpretations of complex situations and people
3. Application: where students use the knowledge in context and employ it effectively in diverse contexts
4. Perspective: where students critically see different positions and embody disciplined skepticism and testing of concepts
5. Empathy: where students project into, feel, and appreciate another’s situations and point of view
6. Self-knowledge: where students project into, feel, and appreciate another’s situations and point of view

Deliberate assessment may not measure all of these every time, but when significant learning needs to be examined, an assessment that requires a combination of these skills can help instructors to know if students understand material enough to transfer their knowledge outside of the classroom.

Stage 3: Plan instruction and learning experiences

Once instructors have created deliberate goals and identified assessment methods, they can plan individual learning experiences aligned to the educational goals and assessment with a deliberate focus on how those individual learning experiences support transfer, meaning making, and skill acquisition.

An important final step can be reflection or feedback. After the individual lessons or the unit as a whole, it is incredibly important to revisit that first step and measure how effectively the individual learning experiences aligned with the overall goals.

3. **Description of session:**

Stage 1: Difference between understanding and knowledge: (5 min)

Participants will find differences between understanding and knowledge.

Stage 2: Case study analysis: (15 min)

Participants will analyze a case of a teacher who implements an excellent lesson but at the end of the lesson, students were not able to explain what they did and why they did it.

Stage 3: Displaying UbD stages: (30 min)

After explaining the stages of UbD, participants will be able to identify the stages of UbD.

Stage 4: UbD plans vs. traditional lesson plans: (20 min)

Participants will compare, evaluate and then reflect on UbD and traditional lesson plans.

Stage 5: Application: (30 min)

Participants will be given lessons from particular textbooks to design a UbD.

4. Conclusion:

Although implementing UbD needs a lot of practice and training, the results are very satisfying. It reduces lecture time and reminds students that their ability to understand, contextualize, explain, and apply content to real life is the true goal of their education. People who are interested can use internet sources or books to read about it or join workshops to develop their skills in designing a UbD plan.

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العبور بالطلاب نحو المستقبل المنشود

سلام بوجي، قسم الإدارة التربوية، ثانوية المقاصد الإسلامية في صيدا، صيدا، لبنان.

الهدف الرئيسي من ورشة العمل هو تجهيز المعلم ليصبح قادراً على بناء و تنمية شخصية و فكر المتعلم و مساعدته ليصبح محفزاً ذاتيا و بالتالي قادراً على ابتكار طرق ابداعية لجعل التكنولوجيا في خدمة المواد الأخرى و هذا ما يتطلبه المستقبل، سيتم الوصول الى ما ذكر عن طريق طرح و مناقشة خمسة اسئلة رئيسية و محيرة و مناسبة، و سيتم التداول مع الحاضرين بأجوبتهم، ليصل الميسر معهم الى اجوبة مشتركة على الأسئلة المطروحة والى تحديد مواصفات المتعلم المحفز ذاتيا و مواصفات المعلم القادر على متابعة هذا المتعلم حيث ان فاقد الشيء لا يعطيه وكل هذا ضمن عمل المجموعات. فلا بد من شرح المعنى الجديد و المهم للتحفيز الذاتي لما له من ارتباط كبير في انجاح اي عمل، حيث انه من اهم الأهداف لهذه الورشة هو تعزيز قابلية المعلم للتغير و مساعدته عن طريق طرح بعض الحلول، و هذه الحلول هي عبارة عن أربع بوابات يجب ان حتى يتمكن من الوصول الى المواصفات المطلوبة و بالتالي سيصبح قادرا على نقل المتعلم الى المستقبل يعبرها المعلم المنشود. ستعرض البوابات مع امثلة و ستناقش من خلال عمل المجموعات، اهم بوابة هي بوابة عادات العقل (Habits of Mind) وهي عبارة عن 16 عادة ، تعطى للمجموعات عدة عادات وامثلة لعدة مواد، عليهم ايجاد العادة و المثل المناسب لها ثم يتم البحث بإمكانية تنميتها عند المتعلمين وربطها بتصرفاته في الصف و حسب المواد، و متى استطاع المعلم ان يكشف هذه العادات عند المتعلم و يوظفها في المكان المناسب، يصبح المتعلم قادراً على ان يحفز نفسه بنفسه ليسير على طريق الإبداع.

تستهدف هذه الورشة المعلمين، ينقسم الحضور فيها الى مجموعات، كل مجموعة تلتف حول طاولة و معهم كرتون ملون و اقلام Marker، الهدف الرئيسي من هذه الورشة هو تجهيزالمعلم لبناء و تنمية شخصية و فكر المتعلم و مساعدته ليصبح اولاًمحفزاً ذاتيا، و بالتالي قادراً على ابتكار طرق ابداعية لجعل التكنولوجيا تعمل على خدمة المواد الأخرى و هذا ما يتطلبه المستقبل الذي نتمناه للطلاب ، وثانيا يتحلى بالمواصفات و التصرفات المطلوبة ليتحصن ويقدر على تحدي الصعوبات و مواجهة التحديات و التغييرات السريعة في هذا العصر. يتم عرض Quote طبعا مرتبط بموضوع التحفيز، و يطلب من الحاضرين شرحه و ذلك لكسر الجليد و اكتشاف مدى اهمية التحفيز، فالإغراءات المحيطة بالمتعلم كثيرة فيجب على المعلم ان يحصنه حتى يساعده لكي يعبر بنفسه الى المستقبل الذي يتمناه له و يناسبه في نفس الوقت. و ننطلق مع الحاضرين "Falling is ok " لنبين مدى اهمية ان يكون المتعلم محفَز ذاتيا، يتم شرح المعنى الجديد و المهم لكلمة تحفيز (Motivation) (اصبح التحفيز ذاتيا) لما لهذه الكلمة من ارتباط كبير في انجاح اي عمل، فمن الضروري ان يتحلى المعلم اولا بمواصفات تساعده على بناء متعلم محفَز ذاتيا حيث ان فاقد الشيء لا يعطيه، تعرض امثلة كثيرة عن التحفيز الذاتي و يتم مناقشتها مع الحاضرين من خلال المجموعات. سيتم الوصول الى كل ما ذكر عن طريق طرح و مناقشة خمسة اسئلة رئيسية و محيرة و هي تناسب المرحلة القادمة، و سيتم التداول مع الحاضرين بأجوبتهم و هذه الأسئلة هي حول كيفية اعداد المتعلمين لمستقبلهم المنشود، و الترتيبات اللازمة لدعم المتعلمين، و مواقف المعلم الناجح القائد والإبداعي الفعال، و ما الذي يمكن أن يفعله المعلمين للمتعلمين ليصبحوا متعاونين ،مفكرين، ناقدين، مبدعين، و متقنين لطرق التواصل مع الآخرين، وكما يفكرون في طلابهم، يبحثون عن اي عادة من عادات العقل يحتاجونها (اذا كان لديهم فكرة عنها) ، عرضت و نوقشت امور كثيرة في هذه الورشة و هذا مقصود، فيجب على المشارك في هذه الورشة ان يقوم بعصف ذهني ليكتشف هو بنفسه الأجوبة و بعدها يعرض الميسر اجوبته على الشاشة و يتم مناقشتها.بعد ذلك يبدأ تسجيل الأفكار على الكراتين و على كل مجموعة ان تعطي مواصفات المتعلم المحفز ذاتيا و دور المعلم و مواصفاته ليصبح قادرا على متابعة هذا المتعلم ثم تعرض مواصفات محضَرة من قبل ميسر الورشة للوصول الى اجوبة مشتركة للأسئلة المطروحة تكون من نتاج هذه الورشة، بعد ان اعطى المشاركون كل ما لديهم و لتكون المنفعة كبيرة من هذه الورشة و لتحقيق كل ما تم ذكره كان لا بد من طرح حلول، و هي عبارة عن بوابات يجب ان يعبرها المعلم. البوابات هي اربعة، تعرض على الشاشة في البداية بدون شرح, اهم بوابة و التي سيتم التركيز عليها خلال هذه الورشة هي بوابة عادات العقل (Habits of Mind) وهي عبارة عن ست عشرة عادة للعقل. كشغل مجموعات يتم تحديد كيفية تغيير العقول لعبور اول بوابة، و تطوير التصرفات و السلوكيات و المهارات وتوجيه القدرات لعبور البوابة الثانية، و كيفية تطبيق 4Cs في الصف، و اكتشاف عادات العقل لدى المعلمين و لدى المتعلمين و و العمل على تنميتها. كما ذكر ان التركيز سيكون على عادات العقل، تعطى للمجموعات عدة عادات وامثلة متنوعة، عليهم تعريفها وتحديد اوقات استعمالها كما عليهم ربط العادة بالمثل المناسب لها ثم يتم البحث بإمكانية تنميتها عند المتعلمين وربطها بتصرفاته في الصف و حسب المواد، ثم يتم عرض عادات العقل و يتم مناقشة الحاضرين و الطلب منهم اعطاء امثلة حقيقية عن كل عادة و تحديد نوعيات الطلاب الذين هم بحاجة لتنمية هذه العادات عندهم و هل هذه العادات تولد مع المتعلم او تكتسب، و اذا كانت مكتسبة هل يجب ان تكتسب منذ الصغر او ممكن بأي عمر كان، و متى استطاع المعلم ان يكشف هذه العادات عند المتعلم و يوظفها في المكان المناسب ، اصبح المتعلم قادراً على ان يوجه نفسه بنفسه و يعبر الى المستقبل المنشود، مستقبل الإبتكار و الإبداع لإحداث التغيير و جعل المواد التعليمية في خدمة بعضها البعض و خاصة التكنولوجيا. أخيرا يتم عرض على الشاشة case study تتعلق بمواد الرياضيات و العلوم و تعرض امامها عادات العقل و على الحاضرين اختيار العادة اللازمة لكل موقف، و اخيرا لتخفيف التعب و التشنج بعد طول نقاش و تفكير يذكر ان روح الدعابة هي التي تأتي بالدرجة الأولى من حيث اهميتها كعادة للعقل حيث انه يقال: (If you can laugh at it, you can live with it) .

ورشة العمل هذه مصممة كما يلي: (أ) عرض quote على LCD Projector (لكسر الجليد) و اكتشاف مدى اهمية التحفيز الذاتي (5 دقائق)، (ب) شرح معنى التحفيز الذاتي و عرض امثلة و مناقشتها مع الحاضرين (10 دقائق)، (ت) تعرض على الشاشة خمسة اسئلة رئيسية و محيرة يتم مناقشتها و على كل مجموعة ان تعطي اجوبتها و بعدها يعرض الميسر اجوبته (15 دقيقة)، (ج)و كعمل مجموعات و على الكرتون الملون الموزع لهم، تقوم كل مجموعة بتحديد مواصفات المتعلم المحفز

ذاتيا و دور المعلم و مواصفاته ليصبح قادرا على متابعة هذا المتعلم و تقوم بعرضها ايضا امام الحاضرين (15 دقيقة)، (ح) عرض المواصفات للمتعلم و المعلم من قبل الميسر (10 دقائق)، (خ) عرض بوابات الحلول بدون شرح على الشاشة (5 دقائق)،(د) على كل مجموعة ان تشرح بوابة و تعطي امثلة حية من الصفوف و ثم يستكمل الميسر ما ينقص (20دقيقة)، (ر) الآن يبدأ التركيز على اهم بوابة و هي بوابة عادات العقل، يعطى لكل مجموعة عدة عادات وامثلة متنوعة و عليها ربط العادة بالمثل المناسب و سبل تنميتها عند المتعلم (20 دقيقة)، (ز) عرض على الشاشة case study تتعلق بمواد الرياضيات و العلوم و تعرض امامها عادات العقل و على المجموعات ربط العادة بالحالة المناسبة (10 دقائق)، (س) شرح عادة روح الدعابة (5 دقائق), (ش) تقييم الورشة (5 دقائق).

Innovative Idea Sessions

Steam in Action

Hiba Bayloun & Zeina Chdeed, GreenField College, Beirut, Lebanon

Transitioning to first grade is a BIG DEAL to a lot of teachers and parents. It is described as the "the days of roaming around the classroom and learning through play are over." Well guess what! In our STEAM classroom, learning took a big shift! First grade student's explored a unit, its properties, and how and why it is important in their everyday life through play and inquiry based learning. Students explored, investigated, and inquired into mathematics and science concepts related to that unit. They also used Art, Engineering and Technology to further understand the abstract concept and to show their understanding and experiment various concepts. Students at such a young age often lack the opportunity to think like an engineer, mathematician, artist and scientist. So the question arises: how can educators explore topics with young children using scientific methods that are more authentic? In this workshop participants will have the opportunity to look into and reflect on authentic student work within a STEAM lesson currently used in a local grade one classroom. Participants will also engage in hands on activities exploring how any topic can be used in an integrated curriculum like STEAM.

The primary purpose of this workshop is to increase participants' ability to explore abstract topics with young children using an integrated authentic curriculum. We will present a unit that integrated science, mathematics and technology applications. Planning lessons and units coherently and collaboratively was not easy for several reasons. First, we didn't use any textbooks to teach the subject matters. Instead we made our own manuals to practice and apply inquiry based learning skills. Second, we created our own scope and sequence that could insure the integration of Science, Technology, Arts, Engineering, and Math. Third, applying a project based learning system requires a lot of preparation work on the part of the teacher and a lot of materials to be available by the school. As teachers, we incorporated curriculum expectations from various subject areas to create engaging, authentic activities. One of the most challenging part is addressing curriculum expectations in a meaningful authentic way where students are engaged and motivated throughout the lessons.

The cross curricular integration of this unit allowed students to critically think about the topic and made connections to real life situations. Students appear to be more engaged and excited about learning as they were able to understand the connections among math, science and technology as well. They basically explored scientific ideas and developed their knowledge and deepened their thinking. To promote such practices, educators need to provide different learning and teaching experiences that engages students with the major inquiry questions and work with them to find answers.

Participants will have the opportunity to experiment with artifacts of students work, videos, lesson plans, and hands on activities. The session is planned as follows:

(a) As a warm up activity, participants will work in small groups to explore an authentic experience and example of a unit taught through integrated curriculum

(b) A presentation about the application of the topics in our classrooms

(c) In small groups, participants will be given a topic and plan it.

(d) Participants will present their ideas

(e) A brief discussion on how that approach can be used in all grade levels.

As a conclusion, We believe that the most important factor in ensuring a successful application of STEAM education in school is dedicated, knowledgeable and ready to learn teachers. It is recommended that schools who want to implement STEAM education should engage, involve and educate the whole school community with that approach. The school community includes: parents, students, teachers and coordinators…

Technology and Change in Grade 12 X and G at BBs

Iman Salman & Dakhlallah Obeidi, Beirut Baptist School, Beirut, Lebanon

On September 2016, Grade 12 Teachers in Lebanon were shocked by the abrupt decision of the ministry of education: suspending and adding objectives to the curriculum.

My session aims at evaluating our live experience as grade 12 chemistry teachers for the year (2016/2017). We will discuss the pros and cons of the new curriculum modifications as well as the technology tools I used, namely: “Teams, Sway, Office lens and One Drive” to make implementing the curriculum easier. We will discuss the students feedback on the new changes in the curriculum. This workshop will include:

A skype call with Mr. Gilbert Sokhen, (an active member in the committee responsible for the academic changes) on the urge behind the step taken by the ministry as well as the suggested future topics. The skype call will be followed Q & A.

Part One: 15 min

In this workshop we will tackle two levels of change: the suspension in some lessons in the curriculum of grades 12X and G, and the technological changes in our school , more specifically in Grade 12.

On a white board the attendees will brainstorm and write the positive and negative implications of this suspension.

The following questions will be discussed:

1. Does suspending certain material leave us with more time for lab work?
2. How has the change in the cognitive load affected time given for critical thinking activities?
3. Are the topics discussed outdated and what are some suggestions for improvement?
4. As a result of these changes, has there been a noticeable improvement in student general performance?
5. What should be added or eliminated in the curriculum of Grades 10 and 11 to help the students be more prepared?
6. How can we solve the problem in naming organic compounds and other issues related to poor translation in the book, (for instance, percent mass composition and percent purity)?

Part Two: 10 mins

A skype call with Mr. Gilbert Sokhen will take place where he will highlight future topics to be taught in Grades 12X and G, and discuss updates planned by the Ministry of Education in Lebanon. Five minutes will be assigned for Q and A in the end.

Mr. Sokhen is a member in the committee that works on the curriculum, as well as a member in the panel that writes the official exams, he has had an active role in changes and modifications taking place in the curriculum, Mr. Sokhen is also a trainer.

Part Three: 20min

My co- author Mr. Dakhlalah Obeidi who is a Microsoft innovative educator and a BBS teacher will explain about the revolutionary changes BBS is going through on the level of technology. He will discuss the challenges the administration and teachers are facing. BBS is using Microsoft tools and e-learning on various levels and Mr. Dakhlalah is conducting several workshops at BBS. Mr.Dakhlalah is also a science and Math teacher for special needs students so he will refer to hands on personal experience to explain how crucial the use of technology in his classes is.

Part Four: 20 min

I will provide a real application of technology used in grade 12, this will be related to:

1- Office lens: Office lens is a mobile application. While correcting exam papers I can take snap shots of students mistakes, save them on one drive (a cloud on the BBS server) when I go to class I open one drive to show them their mistakes. It did really work out for me.it was helpful for the students to check each other's mistakes in addition to my own comments.
I will show the attendees a sample.

2- Teams: can be used to provide extra worksheets and answer students' questions while they are studying at home.as such, I teach the students an easy way to save papers and follow a more environment friendly approach. I created a team with grade 12 X and G which will be shown in our presentation
3- Sway: Sway is similar to power point but with access to the internet; the sway I will share is named "welcome back", it was used in my first session this year in grade12 where I embedded my rules and expectations for the whole year. It will be shown as well.
4- Short Videos: Use of short customized videos that I take here and there to fill up the last 10 min of any teaching session. The topics include pollution, recycling, upcycling, etc…. I will show a video about a lifeguard in a gym measuring pH of the pool. Another video about a lady in downtown recycling old ties. A third one is about a fisherman fishing on the Lebanese shore in a sewage outlet.

Part Five: 5 min

Five years ago I prepared 3 chemistry booklets for grades 10, 11, and 12. These books are customized to meet our needs at BBS. Subject matter is made easier: some objectives were shifted vertically in favor of the learner, more critical thinking questions were included, and lab sessions were added in with every concept. I will distribute hard copies of different chapters of the secondary school years. The aim of this is to share ideas and get feedback.

Geometry from K to 9: beyond papers and pencils

Rima Amacha, Ahliah School, Beirut, Lebanon

Teaching geometry concepts has always been linked to drawing abstract geometric figures and constructions and it was a major interest of educators worldwide. However, students have always struggled in making connections and writing structured proofs. This can be linked to the existence of geometric concepts in curricula for grade levels in which abstract thinking is not yet developed. Young students are not able to relate abstract concepts to their real life applications. This can majorly affect their understanding of geometric concepts in secondary school. Ensuring that our students are getting a solid base of conceptual knowledge can help in improving their analysis and synthesis skills in addition to their ability to apply on this knowledge in a real life context. This session will use a connected classroom application. The main focus of the session will be to highlight the misconceptions and common mistakes that students can do from the participants' own experiences. It also provide new ideas by which teacher can reduce the existence of these misconceptions. Participants will be engaged in preparing, explaining and sharing their ideas about geometric concepts. Participants will use the application to share their comments and suggestions. The session will also give a variety of learning activities that can promote self-learning skills and Geometry has been a focus of all curricula across the world for its wide range of applicability. However, students have always struggled in establishing geometric relations and analogies. Many educational researches highlighted the misconceptions present in students' thinking patterns about specific topics in geometry that mostly arouse when students start using their analysis skills to prove geometric relations. For example, when students have to conjecture relations based on a specific transformation of a geometric figure or sketching a given function based on a special behavior or end behavior. Many of those researches have tried to fix the misconceptions by using special software that serve in improving students' achievement about this specific topic. However,

there was no enough literature about the roots of these misconceptions that are more likely caused by previous misconceptions from primary and elementary school in geometry.

Fuys, Geddes, and Tishler (1988) as cited in the article "Enhancing Geometric Reasoning" published in 2000 by Regina M. Mistretta found that there was too much emphasis placed on formal symbolism and naming in elementary school geometry, while relational understanding of the concepts was underemphasized.

An article published by NCTM reporting the Secondary School Results for the Fourth NAEP Mathematics Assessment: Algebra, Geometry, Mathematical Methods, and Attitudes has shown that a large majority of the students felt that the mathematics is rule based and about half of the students reported that learning mathematics is mostly memorizing. However, doing mathematics as advised by NCTM must not be all about memorizing rules. Students must be able to show critical thinking skills and analysis skills that cannot be developed by formal symbolism and memorization.

The proposer believes that ensuring that all students build a solid base of conceptual understanding of geometry in primary and elementary classes will have a positive effect on the students' achievement in high school geometry. This understanding can be promoted by interactive activities in which students use their surroundings to establish relations. Such activities can use real life situations to highlight the significance of the lessons instead of formal instructions.

This session will present new ideas for teaching geometry concepts through many hands on activities that promote self-learning skills. Participants will be using an app "NearPod" as a connected classroom and will be also engaged in discussions regarding geometry concepts for all levels from primary to middle school.

Strategy:

This session will present new ideas for teaching geometry concepts through many hands on activities that promote self-learning skills. Participants will be using an app "NearPod" as a connected classroom and will be also engaged in discussions regarding geometry concepts for all levels from primary to middle school.

During the session, different active learning styles will be introduced all based on real life examples and situations and all related to geometry emphasizing the vertical alignment between grade levels and the horizontal alignment across subjects. The session will also focus on using apps and website to serve in changing the classroom into a connected classroom in addition to activities that promote self-learning skills and critical thinking skills.

Description of session:

Activity 1: Expectations and Introduction

Allocated time: 5 minutes

Participants will be introduced to the app "Nearpod", and they will be requested to download it on their smartphones to join the online classroom. This application is an online classroom that is

available for free to download on any smartphone, tablet or laptop. All participants will be connected to the proposer's virtual classroom in which polls and requests can be sent directly to each participant's page and all participations can be collected on the proposer's page. The proposer can also use the same application to ensure a follow up of the presentation used during the session. Meanwhile participants will share their expectations regarding the session and will tell about the reason they wanted to attend it. Participants who fail to download the app can engage in discussions and can follow up with the projected presentation of the session
Participant's involvement: signing up to the online classroom / discussion

Activity 2: Back when I was a student

Allocated time: 15 minutes

Participants are asked to do fill in a questionnaire that stands for an ice breaker and that can serve in pointing to the geometry concepts that students struggle in understanding.
The questionnaire will include questions about each participant's individual experiences in school regarding geometry lessons. For example, participants will fill in the blank in expressions of the form:

- Back when I was a student, the geometry lesson I loved the most was ….., because the teacher explained it through …..
- Back when I was a student, the geometry lesson I hated the most was …., because …..
- I chose to be a mathematics teacher because …..
- I will draw an image that explains how I see geometry in the following box (participants will express their own thoughts of geometry through a drawing)

The questionnaires will be collected via the online classroom. Participants will share their answers and experiences. Common answers will be collected on cards to be revisited throughout the session
Participants' involvement: individual work/Discussions

Activity 3: Numbered Heads Together: which comes first?

Allocated time: 15 min. as follows

5 min: group work; 10 min: presentation

Participants will work in groups of 4. Members of each group agree on numbers from one to four for each participant. Each group is given on their Nearpod page a list of action regarding the flow of a session in geometry: participants of a same group have to agree on an order for the given actions and then the proposer will choose a number randomly from each group to share the flow of the session regarding his group's point of view.
This strategy will add a more challenging aspect to group work due to the random choice of the presenter in each group.
Participants' involvement: Group work/ discussion

Activity 4: Micro Lab protocol: it's all in this room

Allocated time: 15 min as follows

5 min: guidelines; 10 min: group work and discussion

The proposer explains the micro lab protocol through a poster and tells participants that this strategy ensures that members of each group have equal opportunities and chances in the discussion. When participants will apply this strategy in their classes, it will also promote listening skills of their students.

Each group is asked to choose a card from the ones collected via the questionnaire. For the misconception present on the card, each group will have to name some material usually present in any classroom that might help in explaining the concept in a way that may reduce the misconception. For example, types of angles can be explained through a rotating door. Lines, straight lines and segments can be explained using curtains. Perimeters and areas can be explained through bulletin boards.

Each group is asked to present his work on a flipchart and discuss it with other groups

Participants' involvement: Hands-on activity/Group work/ discussion

Activity 5: Geometry city

Allocated time: 20 min as follows

5 min: guidelines; 15 min group work and discussion

Participants are asked to form groups of three teachers of a same level (primary /elementary /intermediate)

Each group is given a box of marshmallows/ a box of straws / a box of spaghetti and a box of wooden sticks.

Each group choses a card randomly among the following: tower, garden, fence, outer space castle..

Teachers of a same group need to construct a model that reflects the word they got on their card. Models will be added to a large foam board at the end of the activity and teachers are asked to find connections between the presented concepts.

Participants of a same group will be challenged to relate their model to three different concept in geometry (all based on the misconceptions found by teachers in the questionnaires)

Session closure (5 min)

Participants will be introduced to the website www.smore.com on which their students can design their own flyers including descriptions, multimedia and contact info. The proposer will share his students' flyers with participants. For example, one flyer included a dance academy advertisement for a ballet class that is all about types of angles (shown in the body movement of the ballerina) (https://www.smore.com/wnv3k) Another example is prepared by the proposed about how to choose the perfect seat in a theater based on the angle of vision (the link is not available due to the presence of the name of the proposer on the flyer)

Teachers will then share their feedback on the session.

Conclusion: a square pool is found in nature, but a square by itself is never found. Relying on real life examples and making use of our surroundings can be a very powerful tool to enhance students' understanding of geometry concepts. When we ensure that our students are relating such concepts to their real life, we can make sure that our students can upgrade their mathematics knowledge to a more abstract level by starting with what they perceive. A deep understanding of geometry concepts can therefore lead to a good understanding of the applications of these concepts by keeping up with the 21st century tools and needs.

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develop critical thinking skills through hands-on activities and online tools.

iTeacher-Chatting with Class

Mirna Faour, Institution Educative Amal, Lycée Hassan Kassir, Beyrouth, Liban

Introduction:

L'ampleur de l'écart entre l'élève de l'époque moderne et le système d'enseignement traditionnel qui, dans la grande majorité des cas a du mal à suivre la cadence imposée par l'évolution numérique, perturbe profondément le processus de l'apprentissage. Cela pousse également à chercher un équilibre qui s'adapte à la nouvelle situation. Or, l'intégration se rend difficile et ce en raison du rythme tellement rapide de l'innovation numérique. Il sera alors nécessaire de prévoir des scenarios et de concevoir des stratégies pour suivre les changements de plus en plus rapides.

Dans ce cas-ci, le meilleur choix serait **EDMODO.** Une plateforme pédagogique de type réseau social qui ressemble en apparence à un Facebook . Une interface bleue, photo de profil, mur de publication…

Edmondo est une espace en ligne gratuite, sans publicité. C'est aussi une application Android ou iPad, iPhone.

Planification stratégique:

Le cadre conceptuel comprend :

- ✓ les théories qui concernent la communication, l'éducation, l'instruction.
- ✓ Les nouvelles technologies **IT**.

Participants :
La direction de l'institue, les enseignants, les classes par section, les familles, IT de l'école et les coordinateurs des matières.
Les outils :
Active board, LCD, PC, I Pad, Smart phone, Camescope, Server central, Printer, Outils didactiques traditionnels: papier, crayon…
Récolte des données :

Discussion initiale à titre exploratif avec le public présent pour tester le niveau de la connaissance des méthodologies de l'éducation et de l'enseignement temporelles.
Synthèse de la discussion et exposition de Edmodo :
La nécessité d'offrir aux enseignants, aux élèves et aux parents un espace où ils peuvent contribuer au partage d'informations, d'idées et de matériel en lien avec des sujets éducatifs exige un **langage commun** :
Edmodo, qui a une visée pédagogique principale de transformer la classe en communauté par le pouvoir d'un média social, l'application Web 2.0. Son principe repose sur la possibilité d'apprendre en tout temps et en tout lieu. En ce sens, ce réseau social crée un lien entre les différents utilisateurs et leur environnement. Aussi, Edmodo peut servir à initier les élèves aux technologies et à favoriser l'amélioration de la communication par la langue écrite.
Demande aux participants d'inscrire sur Edmodo.
Le prof créée un compte lors de
sa 1° connexion en cliquant sur
« I'm a teacher », et pour l'élève
« I'm a student ».
Lors de la création du compte, le professeur est invité à créer un 1° groupe... mais il peut ensuite en créer autant qu'il veut. Il peut s'agir de groupe de classes, de groupes d'élèves de plusieurs classes, de plusieurs matières…
Visée pédagogique et utilités Utilité pour les élèves: Edmodo est utile pour plusieurs aspects. Les élèves peuvent vérifier leurs notes scolaires et consulter la liste des devoirs à faire. Ils ont aussi la possibilité d'écrire des messages à leurs
enseignants et aux groupes auxquels ils appartiennent mais non à leurs camarades de classe directement.
Sur la page d'accueil, un outil est disponible pour aider les élèves à gérer leurs études.
Utilité pour les enseignants: De leur côté, les enseignants peuvent mettre des notes scolaires et des listes de travaux à faire à la maison à partir d'Edmodo. Ils sont aussi capables de créer des "quiz", de lancer des sondages et d'ouvrir des sujets de discussion pour leurs élèves, Snapchot. Pour motiver ces derniers dans leur réussite scolaire, les enseignants peuvent même créer des badges de récompense.
En ce qui concerne le partage de l'information, un moteur de recherche permet aux enseignants de retrouver des utilisateurs faisant partie de la même école qu'eux. Ainsi, ils peuvent partager des conseils, des trucs et des outils pédagogiques avec d'autres membres de l'équipe-école de façon virtuelle.
Activités faites sur Edmodo :
Un devoir donné sur edmodo où L'agenda est directement affiché
on a déterminé sa date de remise
Un devoir ou bien un quiz peut être noté :
S'affiche alors la feuille de notes où apparaissent soit les notes soit
« Grade » quand
l'élève a rendu le travail et qu'on ne l'a pas encore noté.

La possibilité d'interagir a été appréciée des élèves et cela à contribué à développer une bonne ambiance de travail. Le relationnel entre les élèves et avec le professeur est

Conclusion :

L'efficacité d'Edmodo dépend de la participation et la collaboration de tous les multidisciplinaires intéressés.

Une analyse appropriée gérée par un groupe hétérogène pour décider l'adoption et l'application d'une stratégie globale sur le choix du tutoriel, un choix qui doit respecter les critères de la nécessité, et la continuité dont le respect des aspects pédagogiques, économiques, sociales, politiques et éducatives.

ECOLE INSTITUTION

élève

FAMILLE SOCIETE

Gestion de temps :

Introduction: 10 min
Présentation du programme: 20 mn
Exercices: 25 mn
Synthèse et discussion : 20 mn

Pendant des siècles, l'homme a pu développer des connaissances et des compétences qui lui ont permis de transmettre les savoirs et de garantir une continuité. En se penchant sur des outils et des instruments qui a su gérer l'homme finit par produire un patrimoine inestimable pour les sciences modernes (Mathématiques, sciences, informatique, médecine, droit, astrologie…). Mais la réussite de cette démarche dépend directement des acteurs concernés surtout les institutions, la société, et le système de l'instruction et de l'éducation, et leur implication dans le processus de décision.

L'époque moderne, quant à elle pose un **défi** pour ces acteurs notamment la vitesse de transmission de l'information et des données grâce à la technologie moderne, et les choix institutionnels et politiques associés à une société orientée à la consumation. Cela conduit en fait à élargir **l'écart** de communication, de collaboration et de coopération avec ces protagonistes.

L'une des questions essentielles auxquelles **l'éducation et la formation** doivent répondre aujourd'hui est celle de **l'introduction des nouvelles technologies de l'information et de la communication (T.I.C.E)** dans le champ pédagogique.

Cette méthodologie fournit des moyens novateurs, non seulement pour la diffusion des connaissances mais aussi pour l'exploration de stratégies d'apprentissage qui favorisent la construction des compétences.

Un égard sur la perspective actuelle permet d'identifier une **question du fond** représentée par l'absence d'un **langage commun** entre, d'une part **l'enseignant tuteur** du savoir acquis durant son expérience professionnelle, durant plusieurs années d'exercices, et d'autre part **l'élève armé par des instruments actualisés de la technologie de l'information moderne**, maîtrise un usage développé et majeure par rapport à l'enseignant, en provoquant une compétition inéquitable qui a pu provoquer une confusion sur les rôles entre les acteurs.

Developmental Workshops

Little Engineers

Amina Maatouk & Samar Saker, Makassed Aicha Om El Mo'minin School, Saida, Lebanon

Our future is full of inventions, from robots and virtual reality to driverless cars and drones. This trend is due to STEM. That's why STEM has become vital to our education system. It creates critical thinkers, provides hands-on learning opportunities, increases science literacy and enables solving tough problems. Thus, it helps the learners to win their future. Participants, in this workshop, will take the role of elementary learners who will be required to work in groups in order to apply many stem projects: they will identify the problem, build their prototypes, evaluate, redesign and communicate. Moreover, they will design stem lessons for their students to help the learners of today be tomorrow's leaders.

In a world that's becoming increasingly complex, where success is driven not only by *what* you know, but by what you *can do* with what you know, it's more important than ever for our youth to develop a set of thinking, reasoning, teamwork, investigative, and creative skills that they need to use in all areas of their lives. These are the skills that students learn by studying science, technology, engineering, and math—subjects collectively known as STEM. STEM pervades every part of our lives. Science is everywhere in the world around us. Technology is continuously expanding into every aspect of our lives. Engineering is the basic designs of roads and bridges, but also tackles the challenges of changing global weather and environmentally-friendly changes to our home. Mathematics is in every occupation, every activity we do in our lives. Moreover, STEM is more than just a grouping of subject areas. It is a movement to develop the deep mathematical and scientific underpinnings students need to be competitive in the 21st-century workforce. Nowadays, STEM education will only continue to expand and grow. So it is time to seek out professional development in STEM and to start in small ways to make it a larger part of our approach to the classroom. Research has shown that students who study STEM are more creative, flexible and able to take advantage of the changes that are predicted in the workforce and workplaces of the future. In addition, teaching STEM in elementary grades opens the door for teachers and students to become tomorrow's movers, shakers, innovators, educators, researchers, and leaders. For elementary classes, STEM education focuses on the introductory level stem as well as awareness of the stem fields and occupations. This initial step provides inquiry-based learning and problem-based learning, connecting all four of the stem subjects. The goal is to pique students' interest into them, so teachers can foster critical thinking and problem solving skills through vital, engaging, interesting and real-world tasks, whilst staying within students' ability to complete them. A great STEM task is challenging and pushes students to seek new information to solve a problem. Providing students with real-world problems and asking them to brainstorm solutions will bring their higher order thinking skills into play. Moreover, STEM teachers work together with students on activities to develop students' critical thinking, communication, assessment, and inquiry skills. However, getting the balance right between making the activity challenging but keeping it within the students' capabilities is important in STEM education. This is especially crucial in elementary years to

encourage and motivate students in their learning. For example, in compiling a Water Cycle project, students do not only learn about the composition and circulation of the water, but they also use the content knowledge technology to search for the needed information. They make models to illustrate their ideas as well so having an "engineering or maker's mind-set", they would use critical skills as they would need to go back a few steps if they have any problems to rectify in their prototype. STEM lessons seem similar to science lessons, but in real, there are some substantial differences. Applying STEM to a lesson can be done with 5 steps:
1- Brainstorm: teachers brainstorm many ideas that belong to a specific topic and create a big list with these ideas. Teachers can brainstorm ideas with students and this is the perfect opportunity to involve students in their learning. 2- Investigate: investigate about the ideas and see what areas they overlap. 3- Apply: Teachers apply the 4 pillars of STEM- Science, Technology, Engineering and Math, teachers should try to have strong discovery with the 4 pillars. 4- Create: teachers create and conduct the lesson. Teachers should be prepared for mistakes, exploration, the trials of discovery and to guide and assist the learning as required. They should submerse students in the subject matter from multiple angles. 5-Reflect: Teachers should reflect on what worked and what didn't work after each lesson. Over time they will become better at judging: – What techniques are best for themselves and their students. – Predicting what they can accomplish in the allotted time. – Understanding what really engages their students and captures their interest, making them motivated learners. While applying these 5 steps, teachers should take into consideration six characteristics of a great STEM lesson: 1- STEM lessons help students apply math and science through authentic, hands-on learning. 2- STEM lessons address real-world problems and issues. 3- STEM lessons include the use of technology and reinforces relevant math and science standards. 4- STEM lessons are guided by the engineering design process. 5- STEM lessons engage students in working in collaborative teams and immerse students in inquiry and open-ended exploration. 6- STEM lessons allow for multiple right answers and reframe failure as a necessary part of learning. Furthermore, STEM education could take place in a separate STEM class or be incorporated into practically any subject and grade level. Of course science and math classes would be able to directly implement STEM-related lessons. Making science and math subjects fun and interesting will not only help students to learn, but might also plant the "seed of interest" that could grow into an exciting and rewarding STEM career. Parents also must encourage their children to pursue STEM activities and increase awareness and interest at home and in extracurricular activities of the merits of STEM education.
This workshop aims to identify the importance of stem education and explain how to apply and prepare stem lessons for elementary classes. The session is planned as follows:

1- Ice breaker activity (5min)

2- Expectations: participants write their expectations on sticky notes and paste them on the wall and then they read the objectives of the workshop. (8min)

3- What do you know about stem? (Discussion in pairs then explanation) (8min)

4- Why is stem important? (Discussion in groups and then explanation) (8min)

5- How to create stem lessons? + Explain engineering design cycle: Discussion in groups and then explanation (15min)

6- Participants will work cooperatively on different stem activities starting from easiest ones:

- First activities: materials are found and ready, participants have to use them to construct a hydraulic canon and vacuum cleaner to explore some air properties. (Some groups will build the hydraulic canon while others will build the vacuum cleaner.) They will make research, explain and deduce the air properties and present their work. (15min)

- Second activities: participants will work cooperatively on one of the following stem tasks, and then carousel strategy takes place: (30min)

  a- Each year a large amount of oil spills from factories and ships into the oceans and seas. This oil affects animals and plants. How can you clean up an oil spill?

  b- You want to grow plants in your backyard. The weather is bad outside. What will you build? Why? How?

  c- What can you build for your pet to live safely? How?

- While working in groups (2^{nd} activity), participants will solve many questions that belong to 4 main titles:

  1- Identify the problem

  2- Do research

  3- Develop multiple possible solutions

  4- Build a prototype (indicate the materials, state the amounts and calculate the costs)

  5- Test the prototype

  6- Communicate your model

  7- Evaluate and redesign

  8- Record and share

They will use cardboard, boxes, sticks, wax gun, Styrofoam, transparent covers, sticks, glue, plasticine, nylon..

7- Last, every group will prepare one stem lesson and gallery walk will take place. (25min)

8- Conclusion, workshop evaluation and distribution of handouts. (6min)

In conclusion, STEM education is an interdisciplinary approach to learning that removes the traditional barriers separating the four disciplines of science, technology, engineering and mathematics and integrates them into real-world, rigorous and relevant learning experiences for students with a commitment to hands-on, collaborative and cooperative learning. STEM is much more than an acronym – it's potentially the passport for the future, since it helps learners develop the necessary skills to be a part of scientific and technological innovations that increase every day. So all young people should be prepared to think deeply and to think well so that they have the chance to become the innovators, educators, researchers, and leaders who can solve the most pressing challenges facing their lives, their nation and the world, both today and tomorrow. Last, according to (National Science Foundation): "In the 21st century, scientific and technological innovations have become increasingly important as we face the benefits and challenges of both globalization and a knowledge-based economy. To succeed in this new information-based and highly technological society, students need to develop their capabilities in STEM to levels much beyond what was considered acceptable in the past."

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NGSS science books

Materials for first cooperative activities:

* Hydraulic Canon:

* Vacuum Cleaner:

Enhancing STEM Learning Using Augmented Reality

Ibrahim Takkoush, Lebanese American University, Lebanon

Technology is defined as "any innovation or device created by people for the purpose of meeting a human need or want" (Jolly, 2017, p. 6). In fact, technology has always been at the forefront of education. From the days of using the chalkboard to our present day, where most classrooms are equipped with sophisticated devices, technology continues to extend the potentials of education. According to Prensky (2001), students of today grow up immersed in technology, unlike most of their teachers who were born prior to the digital revolution. Prensky labeled the two groups of people as *Digital Natives* and *Digital Immigrants*, respectively. Immigrant instructors need to embrace the digital language of the Native students in order to ensure a successful teaching and learning experience (Prensky, 2001). Motivating digital Natives and igniting their curiosity towards learning, requires innovative tools of technology. One of the newest technologies is augmented reality (AR), which utilizes other tools, such as: computers, tablets, and smartphones. Augmented reality (AR) allows the overlaying of virtual imagery into the real physical world in

real time (Zhou, Duh, & Billinghurst, 2008). Several research findings highlighted the benefits of using this technology in education; however, this workshop particularly tackles the use of augmented reality (AR) to enhance STEM learning. STEM is an acronym for Science, Technology, Engineering, and Mathematics. This educational approach calls for integrating the content and skills of the aforementioned disciplines into a unified cross-disciplinary subject to create a student-centered learning environment. "Through STEM, students learn how to use technologies, recognize how new technologies are developed, and analyze how new technologies affect us and others" (Jolly, 2017, p. 6). Accordingly, augmented reality (AR) would serve as a favorable tool to engage students in STEM learning. Other than boosting engagement and motivation towards the subject matter, augmented reality (AR) stimulates the cognitive skills of students to enhance critical thinking, which is one of the essentials of STEM education. This session will contribute to the benefit of Science/Mathematics teachers and coordinators who are currently implementing the STEM approach at their school, or have plans to employ it anytime in the near future. Applying the simplest form of augmented reality (AR) requires at least a downloadable application, a tablet/smartphone, and Internet connection. To my knowledge, the number of schools incorporating the tablet into their classrooms is escalating, and thus they can easily introduce augmented reality (AR) as a new technology tool.

Strategies

Applying augmented reality in STEM education allows the portrayal of difficult concepts in a visual context that favors the comprehension of students towards the topics being taught. This technology also exposes students to different scenarios that are interactive enough to be fun yet serious enough to impart knowledge into their minds. This is known as "hard fun," which is also one of the characteristics of STEM learning. This workshop will introduce three apps that can be downloaded on iOS and android devices. The first app is called Quiver Education, which offers rich educational content designed around topics as diverse as biology, geometry, and the Solar System. Users are required to download and print a coloring sheet pertaining to a specific topic of study (such as plant and animal cells). These sheets can be found on the QuiverVision website. After coloring the sheet, users need to scan it through the app using their tablet or smartphone, and the colored picture will come to life with different annotations and information that support the learning of the student (Figure 1). The second app is called Virtuali-tee, which is marketed as "a magic lens into a world inside the body." Users need to wear a special t-shirt that has a code printed on it. The code on the t-shirt is scanned through the app, and the whole human anatomy will appear superimposed on the t-shirt (Figure 2). Users can zoom in into any organ of the human body and study its characteristics. These apps offer ready-made augmented reality activities that only require an Internet connection and a smart device. The third and final app to be introduced is called HP Reveal (formerly called Aurasma). Unlike the first two apps, HP Reveal allows the user to create and customize an augmented reality segment that fits the purpose of the topic being taught. With HP Reveal, every image, object and even place can have its own overlay (aura). Overlays can be as simple as a picture and a video or as complex as a 3D model. Such app is important for extending the imagination of teachers and for enriching the teaching resources. All these apps will be studied in the context of STEM education.

Figure 1

Figure 2

Description of the Session

This workshop is designed to introduce the technology of augmented reality and contextualize it in STEM education. The session will be divided into three main parts. The first part is mainly based on guided discussions, while the remaining parts are mainly designed to demonstrate this new technology and engage participants in hands-on activities.

- The first part of the session will serve as an introduction to augmented reality (AR) as a new technology of immersive learning. The session will commence with a short video that shows the application of augmented reality in different fields. A guided discussion will follow the video, stressing on all the potentials that this technology can bring to the field of education. This part of the session will also indicate the difference between augmented reality (AR) and virtual reality (VR), which is more conventional among people. Subsequently, the concept of STEM education will be introduced to the attending teachers/coordinators. The focus will be on contextualizing augmented reality (AR) in STEM learning. The allotted duration for this part of the session is 30 minutes.

- The second part of the session will be allocated to demonstrate augmented reality (AR) to the participants. The first two downloadable apps are Quiver Education and Virtuali-tee. These immersive learning apps offer ready-made augmented reality displays. The third app to be demonstrated is HP Reveal. Unlike the previously mentioned applications, HP Reveal allows anyone to create and explore augmented reality (AR). Participants will learn how to use this app to create overlays and superimpose them over trigger images that fit the desired subject matter. All these applications require the Internet in order to function efficiently. The allotted duration for this part of the session is 30 minutes.

- In the last part of the session, participants will be asked to work in pairs and come up with a topic of study that integrates concepts of Science and Mathematics. Then, members of each group need to use the app HP Reveal and create an augmented reality segment that fits the

context of the selected STEM topic. It is preferable that each group consists of a Science teacher and a Mathematics teacher that teach the same grade level. In the end, each group will briefly demonstrate their work to the other participants. The allotted duration for this part of the session is 60 minutes.

Note: Participants will be asked at the beginning of the session to download the app HP Reveal on their smartphones. Participants will also receive a handout that includes all the tackled ideas and apps, in addition to the references used.

Conclusion

Students of today expect the use of technology in the classroom as a norm that reflects the rapid technological evolution in the world. One of the newly developing technologies is augmented reality (AR), which offers ample potentials to the field of education. This technology enhances the motivation and engagement of students towards the subject matter, and stimulates critical thinking skills. Furthermore, technology is an integral component of STEM education, thus contextualizing augmented reality (AR) in STEM will unquestionably support this approach and promote its success. The use of augmented reality in the classroom requires a downloadable app, a smart device, and Internet connection. Hence, the use of this technology is highly applicable. This workshop will introduce three augmented reality apps. Two of these apps offer ready-made augmented reality activities, while the third app allows the user to create and customize activities that directly relates to the desired content.

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One Small Step for Teachers, One Giant Leap for Education.

Majida Saleh, Rawdah High School, Lebanon

The purpose of this workshop is to learn easy experiments that can be applied in a science class in order to prepare lifelong learning students. During the workshop, participants will be introduced to the STEM theory and its importance for a science teacher to be closer into a STEM classroom that prepares students to be involved in the current technological era. Real life problems that require several scientific skills to be solved will be discussed, and participants will be engaged in experiments during which they learn the targeted objectives while finding a solution to their problem using STEM approach. The workshop will enable the participants to prepare their own STEM activities about a topic of their choice, and will have the chance to share with colleagues.

Introduction:

Science, technology, engineering and math are at the core of a new approach in teaching known as STEM. A recent and growing trend, STEM is being incorporated into a number of education programs in the world.

So, whether in math class or science, if you tap into other content, you are coming closer to STEM education, by introducing projects that cut across various disciplines and skill sets. Building a robot, for example, is a multi-disciplinary project that requires an understanding of basic skills in math, science, and technology and helps develop communication, cognitive and problem-solving skills.

Description of the session:

1. **Introduction (15 min)**
   In today's connected world students must become proficient in the 4 C's: Creativity, Critical thinking, Collaboration and Communication. Developing these skills is a natural outcome of a STEM curriculum.

   During 15 min, the participants will be introduced to the world of STEM education and its importance using a power point presentation that shows some of its strategies.

2. **Race Car construction activity. (65 min)**
   During this activity, participants will work in groups of 4, and to learn a scientific concept while applying STEM skills.

   In the first 30 min of this experiment participants will be designing a car (using one of 2 methods), and in the next 25 min they are going to be testing its speed.

   Pre-lab discussion: (5min)
   Gravity-powered car: mass will not affect the speed, but it might keep it from slowing down as much on the horizontal. However, greater mass increases the normal force, which increases friction.

   Car with a motor: there are two common methods to design the car.

   Method 1: connect the wheel directly to the motor shaft (as described in the Proposed Procedure section).

   Method 2: Wrap a rubber band around the motor shaft that then goes around the wheel axle to power the car.

   During this activity participants will be discussing:

   - How the angle of the ramp influences the speed of a non-motorized car?

- How the size of the tires influences a car's speed if it moves at a constant speed?
- Where friction should be minimized on the car and what materials can be used to decrease friction?
- Where the force of friction helps the car move faster, and what materials can be used to increase friction?
- Different ways to design a motorized car (that is, direct drive, belt driven) and how this design would influence the car's speed?

Post-Lab discussion: (5 min)

Student lab reports should include clearly drawn and labeled diagrams of the car and the method used to measure the average speed of the car over 1.00 m for three trials. There should be a section describing each diagram and explaining why certain features of the car's design were chosen. Reports should include a detailed procedure and the data, and they should clearly indicate how students calculated the average speed of the car.

3. In the last part of the session, participants will **design an activity using STEM strategy. (35 min)**

   Each group will choose a scientific topic and will design an experiment to teach students about it, following the same STEM strategy they used in the previous activity. (20 min) In the 15 min left in the session, Participants will share their ideas with each other to benefit from the criticism.

Conclusion: (5 min)

Research shows that as you work with other teachers in Professional Learning Communities you can expect the following results:

• You will increase your engagement with STEM content and how to teach it.
• You will learn more STEM content.
• You will feel better prepared to teach STEM content.
• You will enhance your inquiry-oriented teaching methods.
• You will pay more attention to students' reasoning and understanding.

Steps beyond STEM and STEAM
Rania Zeid Saad, Hanaa Younes & Lucine Markarian, Eduvation School Network, Lebanon

The session will highlight our experience in implementing the spirit behind STEM and STEAM education. Our attempt is to look at authentic real life situations holistically, through our educational projects of integration and final comprehensive project "FCP". These projects integrate various subjects and situations in order to give the learner an understanding of how knowledge from one domain can be transferred into another. These projects tackle problems faced by educators where learners "learn" a skill in one subject but cannot use the skill in

another subject or in real life. It is as if, for the learner, each subject has its own language, which is different from other subjects and from the language of real life. The session will include examples of the means that we use to overcome the need for complicated and expensive technological devices in the learning process. These aspects and projects will be presented and discussed through demonstrations and activities.

I. Introduction:

At EDUVATION, we aim to develop the cognitive, affective and psychomotor skills of learners. The acquisition and execution of the skills in different types of tasks and settings will help learners become initiative takers who work for positive change. We work on strengthening the learner's potential in the areas of research, experimentation, reasoning, self-expression and art to become creative and innovative. All of this cannot be achieved without dealing with the learner as a whole; the Holistic approach remains the main backbone of our educational philosophy and practice. It is what addresses the mind, the body and the soul. Here, we help our learners go beyond acquiring and developing skills to transferring their knowledge and applying it to real life situations. We believe that the world should be perceived from a comprehensive perspective thus we implement a curriculum which guides learners through integrating subjects that stress on the acquisition of complex abilities such as analysis and synthesis.

The chief goal of our educational approach is to surpass transmission of information and reach transformation of knowledge whereby authentic learning takes place; this goal cannot be attained if planning, instruction and assessment are not aligned. Learners' acquisition of competencies, abilities and skills is assessed in order to provide a cumulative rate that reflects their on-going development rather than assigning a less meaningful grade that only shows instant performance on a task.

Based on the characteristics of the Concrete Operational Stage and in accordance with the mission statement of our schools, we started adopting a Final Comprehensive Project (FCP) as an assessment tool where learners can demonstrate various integrated skills developed throughout the year. In the FCP, they will also exhibit their critical and creative thinking. Such tasks increase the learners' curiosity and motivation in learning by allowing them to utilize their various talents and interests. The idea of the Final Comprehensive Project is based on allowing the translation of the requisite abilities in such a way that they can generalize the knowledge they are acquiring in class and build it into functional projects through operating in real life situations. The FCP integrates all disciplines in different interrelated projects and focuses on developing relevancy and applicability

of the existing disciplines to the learners' experiences in the form of authentic integrated projects brought from real life to the classroom instead of producing artificial integrated models. In other words, subjects will not be approached as separate disciplines. The FCP, as was deviated from STEM, was created to integrate the language disciplines with Math, Science, Technology and Art. This was done after evaluating the need of using language in learning science and math.

In order to properly implement this approach, we believe that preparing teachers through training on preparation of plans is crucial before their implementation in the classroom.

II. Strategy:

The session will focus on training teachers to implement integration through real life examples by involving the teachers in preparing integrated lesson plans.

III. Description of the Session:

This session will be divided into four main parts:

1. A brainstorming and inquiry-driven discussion where teachers share their experiences and current methods used for FCP implementation. The discussion will focus on whether these methods are effective and efficient and suggestions for improvement.

2. Presenters will present an example of a type of FCP project whereby different abilities from the different disciplines were linked to show learners the applicability of Math and Sciences with other disciplines and in their everyday life as well as to develop an understanding that in real life application of knowledge there is no separation between the disciplines.

3. Participating teachers will then be asked to do a group activity where they will prepare an FCP taken from real life situations. A format for the planning will be provided in addition to several suggested situations. The teachers can choose to modify the format and, preferably, choose other situations to use for their lesson plan. This group activity will act as a training for the participants to prepare plans for integrated projects using the themes taught in all subjects in a grade level.

4. Finally, the participants will be provided with resources for further references and development.

IV. Conclusion:

As educators, our mission is to prepare learners for life. We are preparing them to be good citizens, good parents, and great leaders in their fields. To accomplish our goal, we are adopting an approach that involves all aspects of the learners' life and integrate it into their education. This is why comprehensive integrated projects play a vital role in the learners' learning process and in education as a whole. Finally, training teachers to apply this approach is desired to achieve the educational outcomes mentioned.

How To Conquer word problems!

Wafika Salim Ofara & Inass Zibawi, Makassed Aisha School, Saida, Lebanon

Over the years, whenever we ask teachers to identify their most challenging part of teaching math, without fail, their emphatic answer is the same: word problems! After hearing this for many times, we decided to offer our help by creating a workshop entitled "How to conquer word problem '" which answers the questions: why do students struggle with solving word problems? And how can we as teachers grow confident and effective problem solvers?" This workshop will also provide best practices for getting students read, write and speak about the math they're learning. Moreover, it stresses on ways to teach problem solving effectively rather than passively. Nowadays, the need for learners to solve word problems is taking the core in mathematics since it strengthens their understanding of math concepts through tackling real-life situations. As we accelerate to the 21st century, our learners' ability to solve real-world problems is more crucial than ever. Thus, arming ourselves with go-to strategies is essential to help them to succeed and tackle all kinds of problems in math and life.

The aim of the workshop is to provide teachers with the opportunity to enhance their professional development concerning ways to teach word problems. As educators, if we want our learners to become better problem solvers, we must not only provide situations where they can practice their problem solving skills, but we also need to make sure that they are thinking meta-cognitively about those skills which they are developing. Many children have been memorizing how to solve problems, thus, thinking cognitively will not only help them solve complex math problems more quickly, but it will expand their number sense as well. Since word problem solving is an important skill for all ages and abilities, it needs to be taught explicitly and in a way that corresponds with the 21st century. This could be through integrating technology in the core of the subject and making learning more interactive starting from presenting a problem in a way that triggers the learner's enthusiasm and interest to solve it using various strategies such as, using manipulative and pictorial representations.

Throughout this workshop, participants will be subjected to a step – by step approach which they may follow for any word problem they face at class. At the beginning of the session, participants will be asked to fill the KWL chart to introduce the workshop; they will state their knowledge

concerning word problem, ways of teaching it, and they will write their expectations, challenges and issues they would like to be discussed during the workshop. Then, the presenter will pose the question: "How can you engage students in solving word problems?" Participants will record their responses on a flipchart, and hence, they will be introduced to the five principles of teaching word problems effectively. Albert Einstein once said: "It's not that I'm smart, it's that I stay with problem longer", this quote will reveal to participants the importance of giving students time to tackle a problem in order to come up with a solution. Students should also feel comfortable letting a problem rest for a while and returning to it later. After that, a short video will be displayed leading participants to realize the 5 paradox of teaching. Later on, four volunteers will be asked to act a challenging problem using puppets, participants will realize how important it is for students to take the role of things and characters in a problem (especially elementary and kindergarten students). The Mentor Jennifer Wathall declared that teaching students to solve problems based on the key words prevent students from thinking ….. Participants will state whether they agree or disagree and to what extinct keywords can help students in solving a word problem using an online survey. After discussing their opinions, they will apply an activity to realize that keywords can help students determine which operation to use in case of doubt. Then, the presenter will show participants problems designed by her students on "scratch program". Participants will get introduced to another technology tool "Thinking blocks" which is an application designed to enhance students' visual skills in solving word problems, and thus they will realize that many problem-solvers find it useful to create "mind pictures" and that mental imaging and portrayal allows them to map out many dimensions of a problem and "see" it clearly.

"How can your students assess themselves in solving word problem?" Participants will record their responses on flip-charts, and after discussion, the presenter will show them a concrete rubric for students to evaluate their performance in solving problems. Later on, they will cooperatively design a fleshed out real life word problem based on a given situation and real life objects. Lastly, participants will use sticky notes to complete filling the category related to "what I learned" in the KWL chart. Then, they will reflect on the workshop using survey monkey (they will scan the barcode to open the survey).

The flow of the session:

(a) Icebreaker Activity (10 min)
(b) Participants will fill the KWL chart (5 min)

(c) Participants will brainstorm ideas about "How can teachers engage a student in solving word problems?" they will sort out "teaching facts " into effective and passive teaching word problem using Yes/No strategy .(10 min)
(d) Participants will be given an inspirational quote and then they will post their expectations on a flip-chart followed by a video to introduce the 5 paradox of teaching.(15 min)
(e) Participants will apply "Act it out" strategy to solve real-life word problem.(10 min)
(f) Participants will vote on a contradictory issue about keywords , then they will apply the "keywords activity" (15 min)
(g) Presenters will share with participants their experiences at their school concerning designing a real – life word problem on" scratch " (5 min)
(h) Participants will explore the applet "thinking blocks "(10 min).
(i) Participants will record their responses on flip-charts concerning "How can students assess themselves in solving word problem?"(10 min)
(j) Participants will cooperatively design a fleshed out real life word problem based on a given situation and real life objects (10 min).
(k) Participants will present their work (10 min)
(l) Participants will complete filling the KWL chart using sticky notes.(5 min)
(m) Participants will reflect on the workshop using survey monkey Participants will be given handouts after filling the reflection sheets about the workshop.(5 min)

Conclusion:

For many students who struggle with mathematics, word problems are just a jumble of words and numbers. However, we can help students make sense of these problems by teaching them problem-solving processes to move forward in their mathematical learning, so they become college and career ready. Those students will able to explain the meaning of a problem and look for entry points to its solution. They will be able to analyze givens, constraints, relationships, and goals. In addition to that, they monitor and evaluate their progress, and that what we are willing to build in our learners.

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Individualizing Instruction through Computerized Branching Scenarios

Wassim Sidani, Canadian high school, Lebanon

Individualized instruction refers to a set of measures the teacher takes in order to meet the needs of the individual student. This is particularly useful in remedial interventions when some students demonstrate poor understanding of the prerequisites for a certain topic. Special

education is another great example of individualized instruction. Students who receive special education services have an Individualized Education Program (IEP). Through an IEP, the school can meet their individual needs and provide accommodations just for them. Providing individualized instruction to each student in a classroom can be challenging especially with large classrooms and high number of enrollees. Computerized Branching Scenarios offer a solution to this problem and requires minimal effort compared to any alternative approach. In individualized instruction, the teaching process is specific and targets one particular need at a time. Students learning with the proposed teaching method (branching scenarios) can skip topics they already know and spend more time on what they need to know or on advanced information.
The proposed workshop aims to introduce the concept of branching scenarios and its proper computerized implementation using a variety of available software solutions.

Introduction: Formative assessment practices take into account the quality of work produced by a student in order to hone and improve their skills (Sadler, 1989). The aim of formative assessment is to identify the student's strong and weak points and to build upon them to subsequently effect significant change in the learning process (Boston, 2002).

The aforementioned change in the learning process often requires individualized intervention plans for students showing poor mastery of the introduced concepts or their prerequisites, which, in turn, requires more time and effort from the teacher. This is especially true for large classrooms with high number of enrollees.

The proposed workshop introduces an efficient workflow that would allow teachers/coordinators to make the most of their time and to be able to prepare multimedia-enriched remedial interventions that the targeted students can easily use, at their own pace, at home or at school.

Strategy: The meaning and importance of individualized remedial intervention is first discussed with the attending teachers as to highlight the high cost of traditional one-to-one remedial methods in terms of time consumption and the availability of professional tutors and custom-tailored learning material. The rest of the workshop will be dedicated to hands-on training on building computerized and multimedia-enriched remedial content, that adapts to the different needs of individual learners through Branched Scenarios and exit tickets.

Description of session: The session consists of the following steps (arranged in chronological order):

- **Ice breaking (10 minutes):**
  - Introducing the facilitator.
  - Getting to know the attendees (introduce your neighbor approach).

- **Introductory discussion (20 minutes)**
  - Discussing what the attendees think the meaning of "remedial intervention" is and when it proves to be most useful.

- Informal discussion/brainstorming of the currently used remedial intervention methods, their advantages, and their shortcomings.
- Agreeing on a list of features the ideal remedial intervention should offer.

- **Advantages of the proposed software solutions addressing the shortcomings of traditional methods (10 minutes) :**

  - The facilitator will point out that most of the modern software tools require internet access and registering an account or paying a certain fee for the teacher to share prepared material with his/her students as well as for students to access the material and interact with it.

  - Attention is then drawn to the shortcomings of this business model, for instance:
    - The Lebanese telecom infrastructure is still lagging behind in terms of internet upload speed, restricted bandwidth quota, and download speed. This makes uploading the multimedia files to include in quizzes as well as fetching the quizzes from the hosting website a challenge especially when the number of concurrent users is high (as it is typically when students sit for a test and use their school's internet connection to fetch the test from a remote server)
    - The teacher might be forced to make his activities/quizzes public in order to use the platform not to mention the possibility of the platform itself shutting down without prior notice thus losing prior work for good.
    - The school's policy regarding grating students internet access which is something most schools forbid in fear of distraction.

  - The aforementioned issues explain why software solutions that do not require internet access are a better choice for this particular task and in this particular context (slow and unreliable internet connection), i.e. the tools of choice should allow distributing the learning material over a local area network without the need of an internet connection.

  - Finally, the said tools should also allow collecting feedback on students' progress **on a per concept basis** as to ensure that the individual learning objectives/skills were acquired.

- **Introducing and explaining the basics of ARSurvey, Android-based classroom survey tool that uses Augmented Reality to obtain real-time feedback from students (5 min).**
- **Allow the attendees to experiment with ARSurvey and to test its functionality using their own devices (smart phones, tablets, laptops…). (20 minutes)**
- **Introduce iSpring suite and its Branching Scenarios and Feedback per Answer features (5 minutes)**

- **Allow the attendees to build their own remedial learning material by taking advantage of the feedback per Answer feature of the tool. (20 minutes)**
- **Ask the attendees to further extend what they've built with the Branching Scenarios feature (30 minutes).**

Conclusion : The suggested workflow is efficient, economic, and time saving. It can be further enhanced and streamlined by adopting a LMS that's specifically designed to account for the teachers' needs and which seamlessly integrates with the generated remedial learning material (This will probably be the next step for teachers who choose to pursue this path). Examples of such solutions are Moodle, iSpring Learn LMS, etc…

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Spark Your Students' Minds to Think and Invent: STEM a Transformative Teaching Model

Enja Osman, American University of Beirut, Beirut, Lebanon

How could STEM education help develop students' 21st century skills and encourage invention, innovation and creativity? In this session, participants will be involved in a hands-on STEM activity about air pollution. They will use the Arduino and other materials to program and build a Particulate Matter sensor model used for measuring the level of air pollutant in their environment. Then, participants will reflect on this activity by describing the different knowledge and skills applied in the four disciplines - Science, Mathematics, Engineering, and Technology – to build their air sensor model and identifying enhancers that would lead to a successful implementation of STEM programs at their schools.

Innovative Idea Sessions

Automated Online Assessments

Hiba Aytour & Yasmin Boubou, Makassed- Aisha School, Saida, Lebanon

Are you looking for a simple way to integrate technology while motivating your students and decreasing the time you spend grading? Why not put your next test on the internet? During this workshop, participants will get introduced to new applications "Socrative and SurveyMonkey" and they will use them to design online assessments. Also, such software will give them the opportunity to engage their learners while being assessed. During the session, participants will practice integrating technology into their classrooms as an effective way to connect with students of all learning styles and to help in developing student's digital citizenship skills.

Technology is everywhere… entwined in almost every part of our culture. It affects how we live, work, play, and most importantly learn. Most students today have been using mobile devices like tablets and smartphones to play and learn since they could crawl. So, it only seems logical to align today's classrooms with the way that our learners want and are used to. Effective technology integration in education helps students stay engaged through incredible amount of new opportunities that will empower them to be more creative and more connected, preparing them for their future careers. For many teachers, evaluating students through manual processes is a tough challenge, time consuming and its results will not be communicated with students and parents in real time. For this reason, integrating technologies in education is increasingly being used as a fundamental and effective teaching and evaluating tool in many schools. Online assessments are based on using computer technology and the networking ability of the Internet to deliver and score tests. Many different question formats are available and can be implemented within the same test, such as multiple choices, multiple response, fill in the blanks and true or false questions. Online assessments can give you instant feedback, unlike paper examinations in a traditional classroom learning session. Automated online assessments give you the option of taking practice tests whenever you want. Students don't always have to be in a classroom setting to take assessments. Some assessments are Internet-based, which allows the student to take the test at home or anywhere else he likes.

Participants will be introduced to the session through two forms of assessments (Paper and Pen assessment, E-assessment). They will be divided into two groups, each participant in the first group will solve a traditional assessment while each one of the second group will be working on a computer to solve an online assessment. Then, one of the presenters will be responsible to find the results of the group working on traditional assessment, while the other one will be responsible about the results of the second group. Through this, participants will figure out the advantages of using online assessments with their learners. After that, presenters will start by showing the participants how to create an online assessment using "Socrative" and "SurveyMonkey". Socrative is a tool that can be used for creating formative or summative assessments. Formative assessment is the consistent monitoring of students' progress to help students and teachers identify strengths and weaknesses to work on, it needs to be done to ensure quality performance and longevity, but many teachers put it at the bottom of their priority list due to the curriculum intensive objectives. For sure, teachers will not be able to manage slips of paper and post it notes to try to get a clear picture of students' understanding each day, so online assessments would be the solution. Socrative is a free application that provides an easy going experience and quality feedback on students' understanding. Getting started with Socrative is simple and straight forward; teacher could be assessing her students in less than five minutes since Socrative offers them the ability to ask questions on-the-fly. Students just need to go to the website (www.socrative.com) or download the Socrative student application on their devices. Teachers don't need to add students individually or create accounts, they simply type in the code associated with teacher's account. Students then enter their name (if required), answer questions and can get feedback and explanations about their responses. After giving an assessment, teacher

will instantly get a chart of summarized responses for each student. Socrative also includes the percentage of students that got each question correct, which helps teachers target the questions and concepts that students need help with most and address misconceptions in real time. Teachers can also download the summarized results in Microsoft Excel or Google Sheets which allows them to manipulate the data and easily compare pre and post-tests. When the demonstration is totally clear, participants will be given the chance to create their own online assessment using Socrative on any subject area, objective and grade level. Presenters will pass by to afford help when needed. In addition to Socrative application that will give the teacher a feedback about each of her students, she can design a questionnaire or survey to collect a whole class feedback or prior knowledge about a specific objective. Surveys can gather the feedback and information needed from students to make everyone's educational journey as fulfilling as possible. As teaching methods become more and more digitalized, online surveys provide an efficient way to conduct tests, polls and quizzes. The task can be created within SurveyMonkey software. The presenters will continue to share with the participants how to use the SurveMonkey software with their students. Using a tool like SurveyMonkey for quizzes can be a great way to make sure that students are learning efficiently. To get started with SurveyMonkey, the teacher needs to add a quiz question using one of the question types they offer (checkboxes, multiple choice, drop down…), she should add the question text and answer choices she needs, marking the correct one. Teacher can display different feedbacks to students based on whether their answer is correct or not. After giving a survey, the summary of each quiz question will show her how students performed on that particular question overall. Finally, participants will create their own survey using SurveyMonkey software.

Flow of the session:

a) Participants will be divided into two groups where each one in the group will be asked to solve either a paper and pen math assessment or an E-assessment to conclude the advantages of online assessments. (10 minutes)
b) Power point presentation will be displayed to stress on the advantages of online assessments. Images will be provided to show them students' engagement and excitement while being assessed online. (5 minutes)
c) Socrative and SurveyMonkey will be introduced and mastered. (55 minutes)
    - **Step 1:** Through demonstration, participants will learn how to create an online assessment using Socrative software.
    - **Step 2:** Participants will design an online assessment based on a specific subject, objective and grade level using Socrative.
    - **Step 3:** Through demonstration, participants will understand how to create a survey using SurveyMonkey software.
    - **Step 4:** Participants will apply the software to design an online survey.
d) Participants will fill an evaluation sheet to give their feedback on the effectiveness process, format and content of the workshop. (5 minutes)

Educational assessment is the systematic process of documenting and using empirical data on the knowledge, skills, attitudes and beliefs. Online assessments focus on the individual learner or all individuals together. Moreover, E-assessments are online tests conducted with the purpose of evaluating, measuring, and documenting the academic readiness, learning progress, skill acquisition, or educational needs of the test takers, so "Why not automate the classroom processes to make it much faster and easier for teachers and students?"

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Systems Syndrome, A STEAM Toolkit!

Maryam Saad, Eastwood College, Kafarshima, Lebanon

The world is dynamic and interconnected, it is not categorized by subject areas as the ones we have on our neat school schedules. To solve real-life problems, our children ought to benefit from an inclusive learning environment that develops their transferable skills in authentic contexts. A study by Miller and Knezek (2013) found that when the liberal arts were integrated with science, problem-based learning and technology, student achievement increased in science and math as well. A STEAM approach to teaching and learning helps spark students' curiosity to explore the world around them and make cross-curricular connections. The session will stimulate and exercise both sides of your brain at once! It is planned as follows: (a) Brief introduction of the 21st century skills and an initial exploration of the STEAM approach (10 minutes); (b) Participants will be equipped with tens of ideas on STEAM projects to enrich the students' exploration of the human body systems. Moreover, the integration of different tech tools such as iPad applications and virtual labs will be shared. (25 minutes); In groups, participants will have the opportunity to take part in designing a project given the necessary guidelines (15 minutes); (c) Participants will try to plan their own projects to a number of pre-assigned concepts (10 minutes); (d) they will present their self-constructed STEAM projects and reflect on its application (10 minutes). Pitfalls associated with the STEAM approach, and possible solutions will be discussed (5 minutes).

The world is dynamic, messy, and interconnected, it is not categorized by subject areas as the ones we have on our neat school schedules. To solve real-life problems, our children ought to benefit from an inclusive learning environment that develops their transferable skills in meaningful authentic contexts. A study by Miller and Knezek (2013) found that when the liberal arts were integrated with science, problem-based learning and technology, student achievement increased in science and math as well. A

STEAM approach to teaching and learning helps spark students' curiosity to explore the world around them and make cross-curricular connections. A STEAM approach takes learners away from fact-based knowledge to develop skills needed to thrive the 4Cs of the 21st century skills essential to our new generation. By intersecting subject areas, learners will hopefully apply the content of math and science to communicate, express, make connections, and innovate for it is believed that learning through STEAM fuels innovation as Eisner (2002) claimed.

Learning music and the performing arts helps students improve literacy, mathematics and cognitive development as stated by a series of studies by Salmon (2010), Smithrim and Upitis (2005) and Schellenberg (2004). STEAM is therefore not only about preparing our students for the future but also, scientifically speaking, this methodology may act as a potential catalyst to accelerate learning.

The session will stimulate and exercise both sides of your brain at once! It is planned as follows: (a) Brief introduction of the 21st century skills and an initial exploration of the STEAM approach (10 minutes); (b) Participants will be equipped with tens of ideas on STEAM projects to enrich the students' exploration of the human body systems. The projects will help students understand, practice, and reflect on the selected lessons through hands on experiences which will help make their thinking visible. Moreover, the integration of different tech tools such as iPad applications and virtual labs will be shared. (25 minutes); In groups, participants will have the opportunity to take part in designing a project given the necessary guidelines and materials (15 minutes); (c) Participants will try to plan their own projects to a number of pre-assigned concepts (10 minutes); (d) they will present their self-constructed STEAM projects and reflect on its application in their sessions (10 minutes). Pitfalls associated with the STEAM approach, and possible solutions will be discussed and participants will have the opportunity to ask questions and voice concerns (5 minutes).

Finally, Oliver Wendell Holmes, Supreme Court Justice once said: "A mind that is stretched by a new idea can never go back to its original dimensions." Hope this session will inspire teachers to build cross-curricular connections through a STEAM approach.

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Reports of School Research & Development Projects

Rearranging Grade 10 Lebanese Curriculum to Become More Logical and Easier to Teach
Houssam El Kasti, Hariri High School 2, Beirut, Lebanon

Most grade 10 students struggle in mathematics due to many reasons, the main reason is teaching many lessons without meaning and without links to other lessons. In addition, the whole grade 10 curriculum is taught as islands of units with no connections. Lately, the chapter on functions was deleted from the curriculum which made things even worse. Through many years of teaching this class we have at the Hariri High School II made complete rearrangement of the mathematics curriculum making functions as a core chapter and through it most of the problematic chapters get introduced. In this way there is more connection between the different parts of the curriculum (pre-calculus and algebra) and students have a way and sense seeing what they are expected to learn. This year we have also taught trigonometry (very essential chapter in grade 10) through functions and it was very successful. In this session I will present how we have done that by showing examples. I need around one hour for that, the session could be hands on for two hours or a lecture for one hour.

Creativity, Activity, Service: Bringing More Meaning to Sciences
Roweida Bawab & Huda Kaeen, Houssam Eddine Hariri High School, Saida, Lebanon

For learning to be meaningful, it should transcend beyond the four walls of the classroom and help students be part of the real world. This can be made through different types projects where students

can work collaboratively or individually to connect concepts they are learning in disciplines to real life contexts. Such connection can be based on individual interests or through significant issues or maybe combination of both. The IB Diploma programme has made this connection systematic and tangible by designing programs and linking them to academic disciplines through interdisciplinary connections. CAS program, one of the IB core, provides opportunities for learners in grade 11 and 12 to engage in enjoyable and significant projects which can help them extend learning beyond the classroom and utilize the learnt concepts in real life situations while at the same time develop their attitudes and values.

This is why sciences need CAS experiences, sciences need to be real, valuable and applied in every aspect in students' lives. CAS enables sciences to be authentic and personal. It encourages students to make use of their information to build a lifelong understanding.

Synopsis

1. Introduction:

Include theoretical background to the study and a review of relevant literature

Creativity, Activity, Service (CAS) is at the core of the Diploma Programme and is the experiential learning part in the diploma. It is a necessity for the student to complete his/her diploma. It is viewed as both enjoyable and challenging. Students indulge in several meaningful experiences and they have to achieve seven learning outcomes. The creativity (C) strand doesn't only require creativity in Arts or music but extends this to include creative thinking, creativity in problem solving. The Activity (A) strands require learners to indulge in several physical experiences to maintain a healthy life. As for service (S) strand, CAS emphasizes service learning where learners are indulged in service with community but such service is connected to their academics. One of the significant aspects of CAS is the involvement in local and global issues where learners have to demonstrate understanding of these issues and sometimes taking an action.

CAS is an amazing opportunity to help create a student who is caring, open-minded, reflective, risk-taking and principled, among other profile attributes. It is an opportunity to take sciences into where they can be useful and practical. CAS encourages students to apply the concepts they learn in sciences the real life.

2. Method:

Describe the participants, the instruments used, procedure, methods of data collection and analysis

This project is a part of IB requirements for grade levels 11 and 12 but its implementation to a lesser extent starts at our school in grade 10. Students are introduced to SDGs (Sustainable Development Goals) and to CAS seven learning outcomes. All projects initiate from the subject disciplines and extend outside the classroom walls, and sometimes outside the school. Students plan their projects through 5 stages (Investigation, Planning, Action, Reflection, and Demonstration). The learning process throughout such experiences can be seen in the students' reflections, one of the CAS project stages. Students have to collect evidence to support their CAS journey. Evidence can include but is not limited to: planning form, graphs, pics, statistics,

recordings, supervisors' form, etc. Student advisors meet and discuss students' performance and take notes of the evidences they showed of understanding their subjects.

3. Results:

Include the results of the study

This experience has left a very positive impact on students' personalities, improved their social, research and management skills and also caused a much deeper understanding of sciences. CAS showed students where to use the sciences they study and allowed them to have ownership of the experiences they go through. These same experiences can range from local to national, and sometimes to global.

4. Discussion and Implications for Practice:

Provide a discussion of the study highlighting in particular the implications of the research conducted for practice.

CAS should be found, under any name and in any form, in all schools that want their learners to graduate with deep and correct understanding of their information. It is irreplaceable

Timeline:

- Icebreaker (5 minutes):

Choose four partner according to the o'clock method (give instructions and ask the participants to ask each other questions including their names, experience, etc that would help them select their group work partners for the rest of the session)

- Introduction of SDGs as goals that everybody has to help achieve, including students and teachers - especially that we want to foster future accountable global citizens.(10 minutes)

Look at plans that show how to integrate SDGs (Sustainable Development Goals) in unit planners

- Introduction of CAS as an experiential learning programme (15 minutes)

- introducing the outcomes
- connections to chemistry and biology as two disciplines
- highlighting the importance of CAS in development of the learner profile.
- show how all the cycles in CAS require a close knowledge of SDGs.

- Look at past experiences:(10 minutes)

Show PPTs on the experiences already done by students (e.g. green wall project, arc en ciel etc)
Allow audience to share their own experiences with any strand of activity, or creativity or service.

- Then, guided by the presenters: (25 minutes)

- provide feedback on the shared projects (group work)
- select a project they have initiated before or are planning to initiate and revise to integrate the CAS stages taking into consideration any of the SDGs.
- Points for discussion during group work

How can we help students initiate such experiences?
How can we use these experiences to foster education?

How can we encourage students to plan such experiences all by themselves?
How can we help students make their experiences sustainable?
How can we help students develop international mindedness?

- Closure: Gallery walk and discussion (10 minutes)

Reflection on the session: decide on it applicability of CAS experiences in your school, then on a post-it note express your feelings and paste it next to where you stand on an emotion bar

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