THE NINETEENTH ANNUAL SCIENCE AND MATHEMATICS EDUCATORS CONFERENCE (SMEC 19)

SMEC 19 CONFERENCE PROCEEDINGS

March 11th, 2017

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SMEC 19 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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Roweida Bawab and Mada Antar, HoussamEddine Hariri High School, Saida, Lebanon

Plenary session 1 - Science

The work of science teachers with resources and professional development: a research perspective

Jean-Marie Boilevin, Université de Bretagne Occidentale, Bretagne

An essential task in teachers' activity is to design, select, modify the resources they use with their students. Its analysis is a major challenge for the research and teacher education. The conference will be particularly interested in the work of teachers of physics and chemistry from the analysis of their interactions with resources for teaching (textbooks on paper, online resources, etc.). Using recent research findings, it will address some questions: What are these resources, where do they come from, how are they related with the other resources used by the teacher? How and why do teachers modify resources? What is the role of professional knowledge in their choice and use of resources? How can the use of resources lead to changes in this knowledge?

Plenary session 2 - Mathematics

Looking at Mathematics Teachers' Work through Their Interactions with Digital Resources: Perspectives for Research and Teacher Education

Luc Trouche, Institut français de l'éducation, Ecole Normale Supérieure de Lyon.

From the development of Internet a new view of teaching work has emerged: teaching as designing (each teacher being seen as her own provider of teaching resources), and teaching as collaborating (Internet allowing the development of virtual community). To what extent is it true? What are actually the evolution of mathematics teachers' work with resources? With which consequences on teaching practices and professional development? Which perspectives for research and teacher education? The conference will address these issues, based on some results of current research programs.

Research Sessions

A Study on the Perceptions of UAE private Secondary School Mathematics Teachers on the Impact of CPD Program Improvement.

Lara Nabil Abdallah and Sufian Forawi, The British University in Dubai, United Arab Emirates

Continuous professional development (CPD) comprises a range of learning activities that allow professionals to continue to learn and develop throughout their careers. The growing demand for better improvement in mathematics education and students' achievement calls for effective CPD. Mathematics teachers need effective CPD programs or activities that enhance their skills and trains them to set high expectations for their students. This study explores secondary mathematics teachers' perceptions of the impact of conducted CPD program on improving their teaching strategies in implementing the new mathematics curriculum in a private school in Dubai, UAE. A mixed methods approach was used with both quantitative and qualitative methods. The instruments used are the secondary mathematics teacher feedback form (SMTFF), teachers' reflective journals and interview forms. Participants' responses revealed that collaboration between teachers and relevance of promoted content should be the main focus of any CPD program. The implications from these key findings explore how different contributions such as continuity and collaboration can be developed to make CPD programs more efficient and relevant. Throughout the study the constant issue that emerged was the need for a paradigm shift in CPD content and methods of delivery to insure that attendees are leaving CPD sessions with useful ideas and activities that are applicable inside their classrooms.

Introduction

Continuous professional development (CPD) is an ongoing training and education that allow professionals to acquire new competencies and to improve their performance. CPD engage staff members in a series of learning activities to enhance their individual practices (Mansour et al., 2014; Khan and Chrishti, 2012). CPD is a catalyst that speeds up the school improvement process, unifies the teaching approaches and enhance the teachers' capabilities. In this light, Khan and Chrishti (2012) identify CPD as a tool that empower teachers and guarantee quality education.

The 21st century is witnessing a major educational reformation which demands a broad spectrum of changes from schools. Hargreaves and Fink (2010) consider education change as easy to plan, difficult to implement and hard to sustain. CPD is considered the means to establish consistency, unity and successful change within an education institution. Successful transition is attained once teachers are engaged in CPD training that is relevant to their needs (Ifanti and Fotopoulou, 2011; Hartsell et al., 2009).

This study is underpinned by learning theories (Lewin's theory, Piaget's theory, Vygotsky's social development theory, and Bandura's social learning theory) and motivational theory (Achievement goal theory, Expectancy-value theory, Self-determination theory). Bandura's social learning theory describes human behavior as a result of continuous interaction between cognitive, behavioral and contextual influences. In CPD, learning is attained when attendees interact to share experience and discuss the relevance of new trends in education to their classroom experiences. Achievement goal theory aims to connect teachers' qualifications to their willingness to attend professional programs. Whereas, the Expectancy-value theory focus on ascertaining the factors that motivate candidates to choose teaching profession. Those theories come to support the core features of effective CPD which are investigated in this study.

Several studies investigated the effectiveness of CPD (Gunnarsdotter, 2014; Getenet et al., 2013), impact of CPD on improving teaching process (Sabah et al., 2014; Ponte, 2012; Kwakman, 2003) as well as the key features of a successful CPD (Ponte, 2012; Earley and Bubb, 2004). CPD content remains obsolete until the sessions are conducted. The relevance of the content to the daily classroom setup of teacher is what proves that the CPD session is effective. The relevance of the content of the CPD to the classroom issues makes it fit for purpose (Getenet et al., 2013; Nisbet, 2004; Lee, 2002).

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

This study used a quantitative-qualitative model, sequential qualitative of mixed method design to investigate the perceptions of private secondary mathematics teachers on the impact of CPD program improvement. Adapting a mixed method approach allows deep analysis of the topic and prevents bias (Meriam, 2015; Creswell, 2003). The instruments consist of a semi-structured questionnaire, reflective professional development journal and interviews. Twenty secondary teachers participated in this study and those were all the secondary mathematics teachers of the school where the study took place. The content of the CPD was designed to enable the new reformation of curriculum implementation at the school and to provide participants with the required knowledge and skills to meet the expectations.

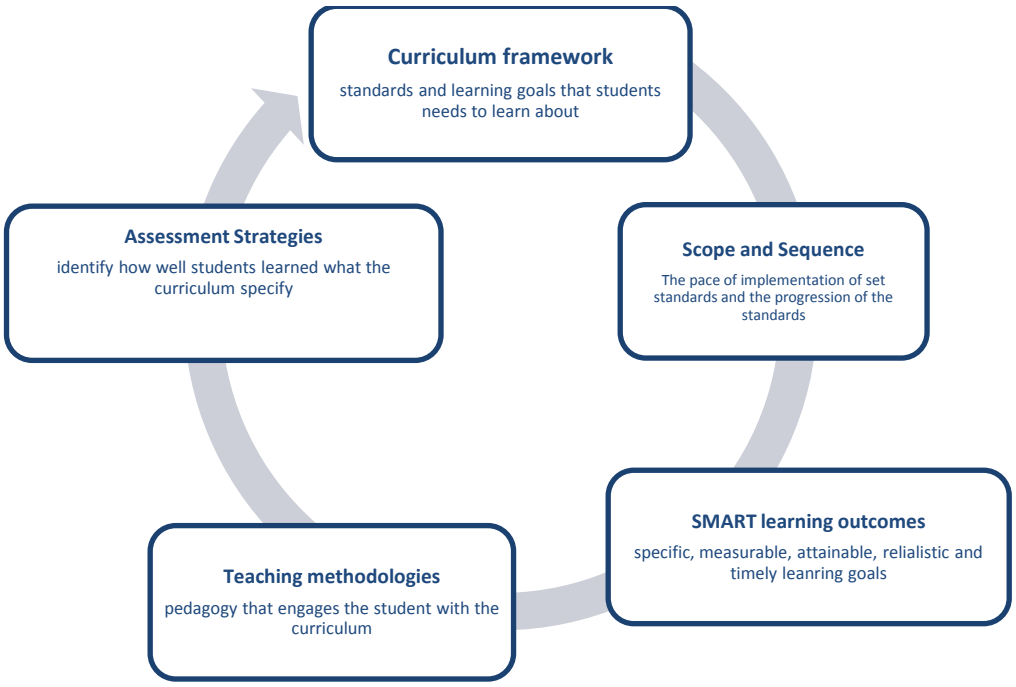

Figure 1: CPD content

The quantitative data was analyzed using SPSS while themes emerged from the analysis of the qualitative data. Hence, it provided rich information about the perceptions of the secondary mathematics teachers about CPD programs. The collective information obtained from analyzing all the results indicated that time span, relevance of content to classroom practices and collaboration throughout the sessions are the core aspects of CPD.

Results

The study findings indicated that the participants were willing to try new approaches in their classrooms. They favored collaborative learning approach during CPD sessions. Participants were convinced about the usefulness of new ideas after they discussed it together. Collaboration consolidate the ideas and allows participants to engage in inquiry-based practice (Landt 2002; Harris 2002; Kwakman 2003; Gordon 2004; Skinner 2010; Sabah, Fayez, Alshamrani, & Mansour 2014).

The analysis of the results confirm that CPD improved the participants' competencies and had a positive impact on their ability to enhance the teaching pedagogies. Those findings confirm that CPD program has a positive impact on participants' abilities (Gunnarsdottir, 2014; Getenet et al., 2013). The relevance of CPD content was identified as the most important feature that results in a visible impact. Visibile CPD impact is achievable once its content is relevant (Sabah et al., 2014; Goodall et al., 2005). Although most secondary mathematics teachers indicated that the practices promoted in CPD are practical but they did not adapt them when planning for their lessons.

Participants were active when the CPD trainer adapted an inquiry-based approach. This allowed them to share their experiences and to reflect on the newly promoted ideas based on their understanding and knowledge. They were motivated to communicate together and to design possible plans to implement the ideas. The approach used to deliver the CPD content has a major influence on participants' willingness to learn (Sabah et al., 2014; Cimer et al., 2013; Rogers and Horrocks, 2010; Hartsell, Herrison, Fang, Rathod, 2009).

Discussion and Implications for Practice

This study concluded that CPD program provided participants with valuable experiences and knowledge to improve their teaching, exposes them to new trends in education to develop their pedagogical knowledge, and an opportunity to collaborate with colleagues to build good relationships. The impact of CPD was firmly established on both behavioral and affective clusters. This study has several implications in the field of teacher training and education. Investigating the participants' views immediately after the training sessions has a limited value while reflective journals encourage the attendees to express themselves widely. CPD trainers can use action research to evaluate and enhance their practices.

The global chances demands continuous school improvements that are designed based on latest trends in education. This study comes to confirm that CPD is a powerful process that can make this change reachable once the content is designed carefully. The uniqueness of this study is due to the CPD approach, time span and the context. The CPD content was designed by the researcher based on identified needs of the private school were the study was conducted. Span of the CPD training was three months. This provided the attendees with a chance to grasp the content slowly and to connect the topics to their daily practices.

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الرياضيات الحديثة

طاهر حمد، مدير مدرسة دار الحياة ، ضهر الأحمر، راشيا، البقاع

تعليم الرياضيات الحياتية يهدف إلى جعل الطالب قادرًا على اكتشاف المفاهيم الرياضية من خلال التجربة العملية والاستفادة المباشرة من تطبيقها وربطها بالواقع الحياتي التي يعيشه في محيطه، بدل المعرفة النظرية المجردة. كما يهدف إلى استكشاف القدرات الابداعية لدى الطلاب من خلال عرض المشكلة عليهم وتركهم يبحثون ويجرون التجارب للوصول إلى النتيجة الصحيحة وفي حال عدم قدرتهم على ايجاد حلول مبتكرة تكون الحقائق الرياضية المعروفة بمثابة الحل الآني الذي يعالج المشكلة التي بين أيديهم ، ما يعني السير بالحقائق المعروفة دون التسليم المطلق بها وبما يبقي الباب مفتوحًا على إمكانية تعديل هذه الحقائق في المستقبل. يتطلب العمل على هذه الفكرة اتباع أربع استراتيجيات أولها الانطلاق من المشروع لا من الكفاية المطلوبة في المنهج، وهذا يعني الاستغناء عن الترتيب المنهجي للكفايات التعليمية، وثانيها الامتناع عن إعطاء الحقائق العلمية مسبقًا، وترك المجال الأوسع للتجربة والاختبار، وثالثها حق الطالب في العمل الفردي أو الجماعي، ورابعها ينحصر في دور المعلمة بمتابعة مراحل الاختبار وإضفاء الشك على ما يتوصل إليه الطلاب تصويباً لعملهم وتصويبا له ليبقى في الإطار العلمي .

المقدمة :

هذا المقترح يهدف إلى عرض بحث إجرائي يتم تنفيذه باعتباره فكرة مبتكرة في مدرسة دار الحياة – ضهر الأحمر – البقاع – لبنان . في مادة الرياضيات ، في صفوف الحلقتين الأولى والثانية .

يهدف عرض هذا المقترح في إحدى جلسات المؤتمر إلى الاستماع للردود والتعليقات التي يمكن للأخوة المتدربين إبداءها وذلك بهدف تعزيز الفكرة وإغنائها . وسيكون من دواعي سرور المدرسة التي تطبق هذه الفكرة تقديمها في مؤتمر المركز التربوي للعلوم والرياضيات في الجامعة الأميركية ببيروت لتعميم الفائدة على سائر الزملاء المشاركين .

وصف الجلسة :

تبدأ الجلسة بعرض مقدمة صغيرة عن طرائق التدريس عامة في مدرسة دار الحياة صاحبة الفكرة :

دار الحياة مدرسة تعتمد المنهج اللبناني لكنها تتمايز عن مدارس التعليم التقليدي بأنها اختارت أن تكون بيئة تعلمية حرّة، فهي تقوم على نظام التعلّم الحر الذي يرتكز على اختيار المتعلم للمناهج وفقًا لرغباته وقدراته وميوله، والتعرف إليها واكتسابها بطريقة فردية، أو بالاستعانة براشد، وهي لذلك تعتمد مبدأ تفريد التعليم. ونظام تقييم مشترك بين البيت والمدرسة يرتكز إلى عدد الأنشطة الإيجابية التي يحققها التلميذ بغض النظر عن تصنيفها أو محتواها ، إضافة إلى إغناء مناهجها بمواد تعلمية إضافية تسهم في رفد التلميذ بالمعلوات العلمية وإكسابه الخبرات التقنية . ومن هذا المنطلق يأتي عرض هذا البحث الإجرائي عن طريقة المعتمدة في دار الحياة لتعليم الرياضيات في الحلقتين الأولى والثانية حيث سيتم التعريف بالفكرة التي نقوم من خلالها بتعليم مادة الرياضيات للطلاب وقد أطلقنا عليها اسم " الرياضيات الحياتية " وهي تختلف عن الرياضيات النظرية التي يتم تعليمها في مدارس التعليم التقليدي .

الأهمية : تتلخص أهمية الرياضيات الحياتية في أنها تخلق واقعًا يجعل الطالب قادرًا على اكتشاف المفاهيم الرياضية من خلال التجربة العملية والاستفادة المباشرة من تطبيقها وربطها بالواقع الحياتي الذي يعيشه في محيطه، أما النقطة الأهم فهي في الاستفادة من الطاقة البكر للعقل البشري، وخلق فرصة للابداع أو الابتكار أثناء عملية التجربة وفي مرحلة ما قبل التعرف إلى الحقائق العلمية . فإما أن يتوصل الطفل إلى حقيقة علمية يكتشفها ويثبتها بالدليل والبرهان أو يفشل في الاكتشاف فتقدم له المعلمة الحقيقة العلمية التي تعرفها بمثابة حل للمعضلة التي فكر فيها وعمل لأجلها.

أولاً : شرح تفاصيل الفكرة وعناصرها (العمل المطلوب من المتدربين في حال رغبوا بتطبيق الفكرة) :

- طريقة اختيار المشروع
- ملاءمة المشروع مع الكفايات المطلوبة في مناهج التعليم
- مراعاة الفروقات الفردية
- تنظيم وتأمين وسائل الايضاح المطلوبة
- طريقة عرض المشروع
- متابعة مراحل العمل
- التحقق من توثيق المعلومة

ثانيًا : استعراض الاستراتيجيات المطلوبة لتنفيذ الفكرة وشرحها، وهي تتلخص في أربع استراتيجيات:

- تركيز محور الاهتمام. المشروع يحدد الكفايات لا الكفايات المحددة في المناهج تحدد المشروع.
- التجربة تسبق المعرفة .
- حق العمل الفردي أو الجماعي.
- الشك.

ثالثًا : عرض وثائقي عن الفكرة :

يتم عرض مقطع فيديو على المتدربين مصوّر في دار الحياة يوثّق عملية تعلم الطلاب بهذه الطريقة، مع التوضيحات والتعليقات اللازمة .

رابعًا : الإجابة عن أسئلة المتدربين .

الاسترتيجية :

في هذا القسم سيتم التركيز على أهم الاستراتيجيات الواجب اتباعها من قبل المعلمين أثناء تطبيقهم هذه الطريقة :

تقوم الفكرة على استراتيجية تعليم خاصة تنبثق من طرح المعلم لمشروع حياتي يستلزم معرفة رياضية ويرتكز إليها في مضمونه وتفاصيله. ومن أهم عناصر هذه الاستراتيجية :

العنصر الأول :

تركيز محور الاهتمام . يتم توجيه اهتمام الطالب إلى المشروع نفسه لا إلى المفاهيم الرياضية المتداخلة فيه . فاالطالب يحاول إيجاد حلول لمشروع يقوم بتنفيذه، وليس المشروع وسيلة إيضاح تهدف إلى اكتساب معلومة معينة أو أكثر. رغم تحقق هذا الأمر بطريقة بدهية وتلقائية.

ومن أهم مرتكزات هذه الاستراتيجية التخلي عن الترتيب المنهجي للكفايات التعلمية، فالمشروع هو الذي يحدّد الكفايات وليس العكس. مع أخذ المعلمة في عين الاعتبار فقط التدرج من الأسهل حتى الأصعب .

العنصر الثاني :

التجربة تسبق المعرفة، فالنتائج التي سيتوصل إليها الطلاب ترتكز بشكل أساسي على عنصر التجربة والاختبار وترك مساحة واسعة للاستكشاف وتثبيت النتائج بعد ذلك كحقائق دائمة حتى اثبات العكس.

العنصر الثالث :

حق العمل الفردي أو الجماعي للطالب، فالمشروع تطرحه المعلمة ولكن المعالجة فردية أو على شكل مجموعات اختيارية وذلك بهدف إظهار التمايز الفردي وتماشيًا مع الفروقات الفردية واكتشاف القدرات . كما يسمح للطلاب بالحصول على مساعدة من رفاقهم أو من المعلمة / الراشد وبهدف الاستفادة من التفاعل المعرفي يسمح للطفل بالانتقال من العمل الفردي إلى الجماعي وليس العكس .

العنصر الرابع :

الشك. وهو العنصر المنوط حصرًا بالراشد/ المعلم ، وهو عملية نقد بنّاء غايته تسهيل الطريق أمام المشروع ليتوافق مع المبادئ والأصول العلمية . بما يضمن سلامة العمل ونتائجه.

توزيع وقت الجلسة :

- المقدمة : 5 دقائق
- عرض الفكرة (العنوان – الأهمية – الشرح - الاستراتيجيات) : 13 دقيقة.
- عرض الفيديو والتعليق عليه : 7 دقائق
- إجابة عن الأسئلة : 5 دقائق.

الخاتمة :

عرض إمكانية إعادة عرض الفكرة مرة ثانية أو التوسّع في عرضها . مع إقتراح تنفيذ زيارة معاينة للتجربة أو ورشة عمل تدريبية السنة المقبلة

Developmental Workshops

Digital Age Language

Amina Maatouk and Waddah Joumaa, Makassed-Aicha Om El Mo'minin School, Saida, Lebanon

Since the world is becoming increasingly digital, learners should be well prepared to be an active part of this huge digital shift by making programming a part of their education. When learning programming, students can understand and tinker with the complex world they inhabit, and they will develop critical thinking, communication, collaboration and problem solving skills. Integrating coding with science subject will boost learners' understanding of science concepts and help them to construct their knowledge. Participants will take the role of "elementary students" by learning the primary skills of programming, through Scratch, to be used in science classrooms in order to improve their students' engagement in the learning process, and to prepare them with a robust 21st century education. In addition, participants will use the MaKey MaKey tool kit to create innovative science projects in order to make science learning more interactive and enjoyable.

In an era of increasingly fast technological innovation and change, there is a growing necessity for people not only to know how to use the connected world (being anything from computers, programmable devices, drones, etc), but also to understand how to utilize all of these things in new, innovative and unusual ways. With this new necessity, coding -the algorithmic language of computers- should become as basic as reading and writing, and be treated as such in school curricula over the world. Coding, in the simplest of terms, is telling a computer what you want it to do, which involves typing in step-by-step commands for the computer to follow. Computers are not clever things, however they are very obedient. They will do exactly what you want them to do, as long as you tell them how to do it correctly. Programming hasn't become this popular by accident. There is a growing understanding that knowing how to program is essential, especially for younger generations. Learning facts is less and less relevant in a world where Google can satisfy just about any question in a matter of milliseconds; it is skills that will enable children to succeed, and that set of skills must include programming. The students of today must be able to not only passively consume this technology, but also to understand and control it, and become an active part of this huge digital shift. Teaching coding in schools from an early age helps children to develop the 21st century skills, like critical thinking, collaboration, persistence, communication and problem solving skills, needed in the complex world they inhabit. That's why, students who learn to program early in life gain a deeper and more complete understanding of the logic and advanced thinking behind programming. Moreover, coding is a **transversal subject.** Once the basis of coding are learned, a variety of problems from different subjects can be solved especially in science. Coding can greatly deepen and enhance students' understanding of science concepts. In addition, integrating science with coding makes science learning more

effective, memorable, motivating and interesting for digital natives. Moreover, it reduces the behavioral problems in the classroom, and helps change the student/teacher roles and relationships: students take responsibility for their knowledge construction, while teachers become guides and facilitators. **Scratch** is a new programming language that makes it easy to create stories, games and animations since it is popular with kids. So, students get really engaged, and **feel their creations in their own.** In addition, Scratch is an easy way to code the MaKey MaKey projects. MaKey MaKey (Make + Key = MaKey) is an inventive tool kit for the 21st century that makes anything into a key just by connecting a few alligator clips. MaKey MaKey is an invention kit that tricks the computer into thinking that almost anything is a keyboard. This allows to hook up all kinds of fun things as an input. That's why, when used in classrooms, it makes learning more interesting and attractive.

The primary purpose of this workshop is to teach participants the primary skills of programming to transfer their knowledge to their science classrooms to prepare activities that enhance their students' learning and develop their 21st century skills. They can transfer this knowledge to their students, it could be with the help of an IT, to prepare scientific projects through coding. Participants will work on Scratch 2 to learn about coding. Different strategies, such as cooperative learning and individual work, will be used to make their learning more interactive and beneficial.

The session is planned as follows:

a- Introduction of presenters and participants and expectations of workshop (5 minutes)
b- Explanation of the workshop objectives (3 minutes).
c- Participants will mention the technological tools they use in their classrooms to integrate technology with education in order to enhance the learning process and involve students in it. (5 minutes)
d- Definition of coding and shedding light on its importance in teaching 21st century skills through discussion (10 minutes)
e- Introducing the Scratch program (5 minutes)
f- Participants start programming on Scratch where presenters explain and show them how each block works to apply on their computers individually.

1- They prepare a marine food chain project to learn about

- sprites, how to import them from a library or desktop
- events blocks,
- motion blocks (how to move the sprites),
- sound blocks: add sound, bring a sound from a library, and recording sound
- look blocks: change color, costumes and backdrop

(30 minutes)

g- Presenters introduce the MaKey MaKey tool kit and explain its use (10 minutes).

2- Participants will use the MaKey MaKey (cooperative learning: 4 members in the group) to prepare a project about conductors and insulators. They will use different blocks on scratch (sound, events, and can change the sprite). They will use four different materials to classify them into conductors or insulators. In each time, they hear the sound of music note, there is a conductor, if not, the substance used is an insulator. (20 minutes)
3- Presenters show participants some projects about the use of MaKey MaKey: animal cell, body parts, flower parts, hygiene practices and then ask them to work cooperatively (4 members in each group) to make their own projects using Scratch, MaKey MaKey and different objects (aluminum foil, modeling clay, cardboard...) (25 minutes)

h- Participants will be provided with extra websites and links to learn more about programming and a CD including Handouts and educational projects using coding. (4 minutes)

i- Last, participants will evaluate the workshop. (3 minutes)

Today, technology has become part of the educational process in which appropriate educational technologies have the potential to make scientific concepts more accessible. Both coding and computational skills enhance science teaching and learning, so they should be a mandatory part of our youth's education. Moreover, they will help our learners to live successfully in a world where technology will be integrated into every part of their personal and professional lives. Last, Linda Liukas said: "Our kids should learn to bend, join, break and combine code in a way it wasn't designed to. It's a whole generation of kids that will use code like our generation used words."

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Assessment in Science: How to Construct an Assessment Task Based on Active Teaching Strategy in the Classroom

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Assessment is any systematic approach for collecting information on student learning and performance, based on different sources of evidence. Many researches showed that assessment remains the weakest aspect of teaching. And where assessment is ineffective, teachers do not routinely check pupils' understanding as the lesson progresses. There are many different ways to learn about student strengths and weaknesses, identify specific learning needs, and collect feedback on the effectiveness of instruction. Besides the formal timed tests and quizzes, assessment includes students' other work, students' utterances made while conducting lab investigations and class discussions, in reflections, in exchanges among teachers and students, and in feedback on work. Hence authentic assessment is needed because it requires students to apply scientific information and reasoning to situations like those they will encounter in the world outside the classroom as well as situations that approximate how scientists do their work. Authentic assessment can include many of the following: observation, essays, interviews, performance tasks, exhibitions, demonstrations, portfolios, journals, teacher-created tests, rubrics, self- and peer-evaluation. It includes a task for students to perform and a rubric to evaluate performance on the task. The aim of this workshop is to develop school science teachers' insight into different ways of finding out what students know and understand at different stages of learning a topic. Science teachers will understand their roles in developing learner-centered assessment practices; develop authentic assessment techniques where the child is directly responsible for his/her learning and its outcome, and design rubrics and records for monitoring students' progress.

Introduction:

Assessment is any systematic approach for collecting information on student learning and performance based on different sources of evidence (Stripling, 1993). A wealth of research studies showed that assessment remains the weakest aspect of teaching. And where assessment is ineffective, teachers do not routinely check pupils' understanding as the lesson progresses. In almost all institutions, there are systems for the assessment of young people's levels of literacy and numeracy. However, the resulting information is not used efficiently to inform teaching and learning (Ofsted, 2007). The collection of marks to fill up records is given greater priority than the analysis of pupils' work to discern learning needs. These cumulative effects of learning in order to pass tests discourage intrinsic motivation as students' progress through school. Thus, students need to be active participants in assessment of their own learning rather than passive respondents to a series of tests. For this reason, assessment must be guided by principles of learning and development, not routine testing prescribed by manuals and mandates (Paris & Ayres, 1994).

Opportunities for meaningful assessment occur numerous times each day—within interactions, in conversations, by way of observations, and even as part of traditional assessment. Many studies showed that the practice of formative assessment from 5-year- olds to university undergraduates across several school subjects, and over several countries produce significant learning gains

(Osborne & Dillon, 2010) specifically the concept of feedback. The more a teacher knows about what the students know and don't know, the better the teacher can change instruction to address student learning needs. There are many different ways to learn about student strengths and weaknesses, identify specific learning needs, and collect feedback on the effectiveness of instruction. Besides the formal timed tests and quizzes, assessment includes students' other work, students' utterances made while conducting lab investigations and class discussions, in reflections, in exchanges among teachers and students, and in feedback on work. Everyday assessment is local and contextual. It depends more on the skills, knowledge, attentiveness, and priorities of teachers and students than on any particular set of protocols or strategies (NSAT, 2003). As teachers change to make formative assessment a constant feature of their work, they will inevitably be changing their roles as teachers. They have to be more interactive with their students, and they have to give them more responsibility for learning. This leads to a change in role, from directing to empowering students (Black et al. 2002).

The aim of this workshop is to develop school science teachers' insight into different ways of finding out what students know and understand at different stages of learning a topic. In this workshop, science teachers will understand their roles in developing learner-centered assessment practices; develop authentic assessment techniques where the child is directly responsible for his/her learning and its outcome, and design rubrics and records for monitoring students' progress.

Strategy:

Assessment in education is the process of *gathering*, *interpreting*, *recording*, and *using* information about pupils' responses to an educational task (Harlen, Gipps, Broadfoot, Nuttal, 1994). It helps inform both instructors and students about learning. There are three types of assessment: Diagnostic assessment, Formative assessment (Assessment *for* learning) and the Summative assessment (Assessment *of* learning). The methods to assess students' performance vary and can be qualitative or quantitative. Quantitative methods include: true-false items, multiple choice item, complete item, short answer item, essay item, practical examination, papers, questionnaires, and checklist. On the other hand, qualitative methods include concept map, inventories, projects, peer rating, self rating, portfolios, observation, discussion, and interview.

Science teaching focuses on developing science process skills (intellectual skills closely associated with inquiry learning) including: observing, communicating – writing objectively, classifying, measuring, relating objects in space & time, predicting, inferring, controlling variables, defining operationally, and experimenting. Hence authentic assessment is needed because it requires students to apply scientific information and reasoning to situations like those they will encounter in the world outside the classroom as well as situations that approximate how scientists do their work. In authentic assessment, students do science experiments, conduct social-science research, write stories and reports, read and interpret literature, solve math problems that have real-world applications. Authentic assessment can include many of the following: observation, essays, interviews, performance tasks, exhibitions and demonstrations, portfolios, journals, teacher-created tests, rubrics, self- and peer-evaluation. An Authentic Assessment usually includes a task for students to perform, and a rubric by which their performance on the task will be evaluated. To create a rubric we need to identify standards, select an authentic task and to identify the criteria for the task. In addition different record forms may be prepared to evaluate students' performance.

Description of session

Using an interactive style, participants will have opportunities to determine if a more student-centered, active learning environment is working, define assessment, and value the assessment for learning. They will differentiate between qualitative and quantitative assessment methods in terms of simplicity and potential for assessment of learning. Participants will make self assessment for their own practices regarding assessing what students know and understand at different stages of learning a topic. They will learn about authentic assessment methods, prepare rubrics, and design different records for monitoring students' progress.
The sequence of the workshop will be as follows:

No	topic	Activity type	Duration
1		Welcoming and introduction	5 min
2	Definition of assessment	***Brainstorming*** Participants will answer an open question: What are you currently doing to determine if you are successful in the classroom? In other words What would you do to determine if a more student-centered, active learning environment is working? Answers will be written on flip chart and then ask them to write an operation definition for assessment.	10 min
3	Methods of assessment	***Think- pair-share*** List all the forms of assessment that you have used in your teaching. Introduce the value of assessment for learning	10 min
4	Types of assessment for learning	***Case study*** of a teacher using different types of assessment. Read the case and identify methods of assessment used. Discuss the types of assessment used and their perceptions towards their effectiveness.	15 min
5	Self evaluation	***Checklist*** Participants will fill a self assessment checklist. Answers will be discussed quickly	10 min
6	Authentic assessment	***Showing video*** Observe a video on authentic assessment	15 min
7	Forms of authentic assessment	***Discussion*** Discuss different forms of authentic assessment, how to create rubrics and records needed to monitor students progress.	15 min
8	Records for monitoring students' progress	***Group work (groups of 4 or 5)*** 2 groups will select an interactive teaching strategy for teaching a science topic, work in groups to prepare a rubric for assessing the progress. 2 groups will prepare records for monitoring students' progress.	40 min.

Conclusion:

This workshop will focus on some aspects of assessment for learning: some methods and ways to records progress. Participants may bring with them the records they use at school to monitor students' progress, or other rubrics to elaborate. Based on the workshop they may make necessary amendments.
In the same aspect, questioning techniques is also very important component in the assessment for learning. Asking questions is a stimulating and interesting way to engage students in new topics and assist their learning, and to find out about students knowledge and understanding. But due to time constraints, they will not be covered in this workshop.

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Who Said So! Evaluate Source Reliability during Internet Research Tasks

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Pedagogies for the 21st century address new competencies that today's learners need to develop in order to attain their learning autonomy. To master the skills they require, learners must engage in meaningful real-world problem solving experience to construct and organize knowledge, hold in-detailed research, enquiry, writing and analysis, and communicate effectively to audiences. Researching is one of the prerequisite skills required by learners in every step of their problem solving experience; learners are expected to do research mainly to prove the significance of the problem they are going to solve and to find and report a review about the solution they suggest. All this require the readiness of teachers who are following up with their students through online researching. Five criteria for evaluating online resources are suggested: (1) Accuracy, (2) Authority, (3) Objectivity, (4) Currency, and (5) Coverage. The objectives of this session are (a) introducing online research tasks and their uses in teaching and learning, (b) Investigating the challenges of online research tasks, (c) Identifying the criteria to assess reliable resources, and (d) Scaffolding research tasks to complete effectively science projects, This session is targeting science teachers and coordinators for middle and secondary levels. Participants will have the chance to share their experiences in this issue and reflect on their own practices and challenges that they usually face when doing online research.

Pedagogies for the 21st century address new competencies that today's learners need to develop in order to attain their learning autonomy (UNESCO, 2015). To master the skills they require, learners must engage in meaningful real-world problem solving experience to construct and organize knowledge, hold in-detailed research, enquiry, writing and analysis, and communicate effectively to audiences (Barron and Darling – Hammoud, 2008). Researching is one of the prerequisite skills required by learners in every step of their problem solving experience; learners are expected to do research mainly to prove the significance of the problem they are going to solve and to find and report a review about the solution they suggest. All this require the readiness of teachers who are following up with their students through online researching.

Learners, in their researching tasks, focus on online resources, neglecting actual books (Jones, 2002). In previous studies investigating how students' online researching processes, it was found that successful research is directly related to the ability to discriminate between reliable and unreliable sources and the selection of reliable reading material for a high percentage of the research time (Wiley, Goldman & Graesser, 2002;)

A survey of Advanced Placement and National writing project, was conducted in US to explore teachers' views of the ways today's digital environment is shaping the research and writing habits of middle and high school students through teachers' experiences and perspectives (Purcell, Rainie, Heaps, Buchanan, Friedrich, Jacklin, Chen, and Zichuhr, 2012). Some of the results

obtained from this study were students' overdependence on search engines and the challenge they face in judging the quality of online information.

Based on these results, it is clear that students and teachers, need instruction in evaluating the reliability of information that they find on the Internet. Work by Brem, Russell & Weems (2001) has shown that in general students are fairly uncritical of the arguments they read on web pages.

Five criteria, used to determine the quality of print information in libraries, as suggested by the Library and Documentation Center of United Nations Framework Convention of Climate Change (retrieved from: http://unfccc.int/essential_background/library/items/1420.php), can be applied to the evaluation of web resources:

Criteria 1: Accuracy

To determine how reliable and free from error the information contained on a website is, it is important to look at who is hosting the site. Is it a University, a government, a professional association, a commercial host, an advocacy group, a publisher? What are their biases? A good website should state its purpose and intended audience. It is always a good idea to check with other web resources, journals or magazines that publish website reviews to see if the site has received a stamp of approval, and if so, by whom. Usually, to verify the information on the website, we compare it with information found in other print and/or web-based sources.

Criteria 2: Authority

To determine the authorship of a website, we must examine the page closely for information about the author and to see if anyone else has contributed to the site through references. A good website should provide a way to contact the producers of the site. It is important to identify the type of Webpage to i.e. educational, professional, personal, advocacy, advertising etc.….

Criteria 3: Objectivity

To determine the objectivity of a website, we need to check if advertising and informational content are being supplied by the same person or organization. If so, we have to examine whether there is a bias to the informational content. Keep in mind that many websites with excellent information are sponsored by commercial entities or take advertisements to finance the website.

Criteria 4: Currency

To determine the currency of a website, we need to find out when the page was last updated. Also we look to see if there are broken links on the site; it could be an indication of an abandoned page.

Criteria 5: Coverage

To determine if the information is adequately covered on a website, we compare the information with information found on other websites. Does one site provide more information, more references, more contacts? Also we compare the information on the website with information available in print sources such as books, journals, reports, etc. (if available).

While integrating project-based learning or problem-solving performance tasks, students are expected to do researching for their outcome, however, without the teachers' guidance they will be lost in the world of web information. Scaffolding research tasks into phases is prerequisite for the success of the student's outcome: (1) Researching the community problems (2) Researching the science concepts behind latest sustainable inventions solving problems, (3) Researching the beneficiaries from the project done, and (4) Researching the type of materials and the way these materials work for their project

The objectives of this session are (1) introducing online research tasks and their uses in teaching and learning, (2) Investigating the challenges of online research tasks, (3) Identifying the criteria to assess reliable resources, and (4) Scaffolding research tasks to complete effectively science project,

This session is targeting science teachers and coordinators for middle and secondary levels. Participants will have the chance to share their experiences in this issue and reflect on their own practices and challenges that they usually face when doing online research.

The session will start with an icebreaker activity (5min), the presenter will introduce online research tasks in science teaching (10 min), and then the participants will watch a short video shedding light on students' challenges in using online resources (10 min). The presenter will suggest evaluation criteria to assess the reliability of online research (10 min). The participants will be given the chance to interact in groups to apply the discussed criteria by evaluating different online webpages, blogs… (assigned by the presenter), each group will present their evaluation to be discussed by others (20 min). The presenter will propose a scaffolding researching strategy for the completion of math or science projects (10 min). The participants in groups will use the scaffolding strategy to set research questions for different problem-solving projects (35 min).

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Math in the Outdoor Space

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Have you ever heard your kids complain that their math class has nothing to do with their real lives? That means maybe they need more real life math experiences outside the class. The good news is that you can easily provide these math experiences with fun activities that incorporate easily into their daily life. During this workshop, participants will "live" an outdoor math class filled with innovative hands- on activities and strategies. They can apply these activities with their students to get them actively involved. Also it will give them the opportunity to think beyond textbook and challenge their students by making their classrooms more interesting through outdoor learning. During the session, participants will discover the strategies for preparing an outdoor Math class in order to make Math more exciting and relevant.

This workshop aims to motivate teachers to change their math classrooms into more interactive ones and get them prepared to use it in more varied ways including being prepared to "let go" and give their learners the space to explore. In order to develop deep mathematical understanding and secure numerical skills, children and young people need to engage with math in meaningful contexts where abstract mathematical concepts can be applied to real life situations. Therefore, taking math into the outdoors would provide an ideal vehicle for this approach. Numbers are tools people use to make their lives less complicated both outside and inside a classroom. We believe that every young learner should experience the world beyond the classroom as an essential part of learning and personal development, whatever his age, ability or circumstances are. Such experiences help learners to make sense of the world around them by linking feelings to learning, and allow them to transfer the experienced learning outside into their classroom. Moreover, all learners should have the opportunity to participate in a range of planned, progressive and creative outdoor learning experiences that should be part of the curriculum. These should be frequent, regular, enjoyable and challenging. Thus, outdoor learning is the responsibility of all the staff and this means that every teacher and educator needs to plan and integrate outdoor learning as part of their teaching approaches.

Participants will be introduced to the session through a quote **"I am a child… I need motion… I need novelty… I need adventure and I need to engage the world with my whole body"** and they will be asked to model a **"human graph"** that reflects their opinion towards the possibility of **"applying math class in the outdoor space".** Then, they will share the reasons beyond their responses with the presenters. After that, participants will experience a collection of outdoor learning activities that could be applied with their learners. During the outdoor session, they will be subjected to hands on activities and will be assigned with different tasks to be done in groups. In addition, many strategies will be applied and participants will follow essential steps to accomplish the educational goal with all their senses involved in constructing new knowledge and skills. This procedure will give the participants an opportunity to realize that taking students outside the classroom requires careful planning of the learning activities and attention to the risks

that might be faced. Thus, they will figure out the procedures of this plan taking into consideration the **initial discussion** that should be settled at the beginning to set the goal of the session. Then, they will recognize that a **warm-up activity** should be applied with their learners to enhance their motivation and to get their muscles ready for the **learning experience**. Next, clear instructions would be given to the learners to apply the task safely in order to meet the required goal. Finally, a **calming down activity** should be done to relief students' muscles and to slow down their hyper-activeness. In addition, learners will reflect on the skills and knowledge that have been learned and applied. When discussion is over, participants will return back to the room and a power point will be presented to clarify each step through displaying images for outdoor activities done with our learners. Later on, participants will fill the "Tool Box" which is a strategy to sum up all the activities done during the session. Finally, presenters will distribute a planning sheet that includes the steps for organizing an outdoor math session to be filled by the participants in order to make a plan and to apply what they have acquired during the workshop. Participants will be then asked to present their plans stressing on the importance of each step.

Flow of the session:

a) Participants will get introduced to the session through a quote and a human graph will be modeled. (20 minutes)
b) Participants will experience two **outdoor learning activities** (Algebra and Geometry) that will be done outside the room. (45 minutes)
    - **Step 1: Initial Discussion:** Through oral discussion, presenters will figure out participants' prior knowledge, and the aim of the activity will get clear through questioning strategy.
    - **Step 2: Warm-up Activity:** Participants will get motivated through different strategies such as using their bodies to model a figure…
    - **Step 3: Learning Experience:** Participants will follow the instructions given to them in order to apply the task and to acquire the learning objective that lies behind the outdoor space activity.
    - **Step 4: Calming Down Activity:** Participants will be asked to apply an activity that will slow down their movement. Forming a circle with the presenters, a discussion will be held and participants will sum-up the new ideas that they have acquired during this session.
c) Power point presentation will be displayed to reinforce participants' understanding of the steps for planning an outdoor session. Images will be provided to make the concept clearer. (10 minutes)
d) A discussion will be held and all the strategies used will be summed up in a "Tool Box" that might help participants while planning their outdoor sessions. (10 minutes)
e) Participants will be asked to fill in a "planning sheet" form in order to organize a purposeful math session. Each plan will be presented and discussed. (30 minutes)

f) Participants will fill an evaluation sheet to provide their feedback on the effectiveness process, format and content of the workshop. (5 minutes)

Teaching and learning can become inherently spontaneous and student-centered when moved from the confines of the classroom into the world at large. The goal beyond our workshop is to provide educators with different strategies to engage, empower and to motivate learners through outdoor activities. Many benefits for outdoor learning can be expected since it provides higher level of motivation, greater curiosity and limitless resources. Outdoor learning builds an important bridge between theory and reality, and it enhances students to form connections with the surrounding. Getting outside the classroom facilitates authentic or experiential learning and gives better access to the main pathways to learning (visual, auditory and kinesthetic).
As a conclusion, Mother Nature is a great teacher and getting kids outside to learn and play is good for their brains and their bodies.

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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:

- Egyptian Fractions:
  The Egyptians of 3000 BC had an interesting way to represent fractions. Although they had a notation for 1/2 and 1/3 and 1/4 and so on (these are called reciprocals or unit fractions since they are 1/n for some number n), their notation did not allow them to write 2/5 or 3/4 or 4/7 as we would today.Instead, they were able to write any fraction as a sum of unit fractions.

- Fibonacci's algorithm:

In mathematics, the Fibonacci numbers are the numbers in the following integer sequence, called the Fibonacci sequence, and characterized by the fact that every number after the first two is the sum of the two preceding ones.

Fibonacci numbers appear in biological settings, such as branching in trees, the arrangement of leaves on a stem, the fruit sprouts of a pineapple.

- Angles: A pattern develops when bisecting a circle.
  The resulting angle always reduces to 9.
  So, is there a divine code embedded in our number system?
  It is a question to be asked for the attendees.

- Pythagoras' Theorem: Re-exploring the theorem (epstimology of this theorem).
  - ❖ Understanding who is Pythagoras
  - ❖ Inquiry based teaching idea
  - ❖ Technology and visualizing the theorem
  - ❖ How to assess students' knowledge of this theorem in real life contexts.

- Equations:
  How to find variables in a real life situation.

- Activities that enhance logical thinking (some brain teasors).

Description of the session:

The participants will be sitting in groups of fours or fives.

- 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: will be the Egyptian Fractions. It takes 10 minutes to write down the system. Followed by the explanation of the unit fractions facing a problem solving (15 min.)
- Activity 2: Angles: sharing and discussion. (15 min.)
- Activity 3: An inquiry approach to the Pythagorean theorem: PowerPoint presentation on Pythagorean theorem, inquiry activity and videos (20 min)
- Facts: Sharing facts about Fibonacci sequence and fractals (the beauty of mathematics. (5 min.)
- Activity 4: Equations: sharing and discussion. (5 min.)
- Activity 5: Solving sample real life problems in groups. (30 min.)
- Activity 6: Finding the circumference of the earth. (10 min.)
- Closing. (10 min.)
- Opening the door for questions. (5 min.)
- Complete the evaluation sheet. (3 min.)

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

"Mathtech – What to teach vs. How to teach"

Hanan Ghassani and Hasan Khodor, Phoenix International School, Beirut, Lebanon

What are the most effective resources that teachers can rely on, in order to prepare a creative classroom environment? Does technology admit any relation? Are technological resources beneficial in teaching? What are some examples and evidences on the importance of using these resources? These questions and many others would have answers in the workshop in addition to a sufficient description about mentioned resources.

Introduction:

One can investigate a range of educational technologies and consider their affordances and limitations in relation to the learning goals. Yet, making decisions about educational technologies can be tricky. In general, we have to ask if a specific technology will enhance student learning. The effective use of any technology in teaching requires thoughtful consideration and planning. Whether low tech (a chalkboard) or high tech (a 3-D interactive visualization). A tool's learning benefits depend on when, where, how, and why we use it. May be a tool or set of tools can align with our goals, and provide us support as we select and integrate solutions effectively into our teaching. The role of the teacher is a facilitator of learning rather than an instructor of information. Resources, which
we are going to talk about, show the impact of technology on students' thinking and learning. In fact, we don't teach math, we play it. We look for math as an art rather than a science.

Procedure:

The presentation will handle the technological resources that can be used in math and science. Among these unlimited resources, we'll focus on the most important ones. Interactive resources such as Edumedia, applications such as Turnitin, software such as sagemath & active inspire, tools such as tablets, games, etc... will be introduced. Attendees will work in groups, where each group will be provided by data about a certain topic with guided instructions followed up by presenters.

In Phoenix International School, we are interested in the goals of SMEC.
It is important for teachers to get a continuous intellectual and professional development. Exchanging ideas and researches about teaching is very effective in providing the best ways of dealing with students thinking. For this reason, we wish to have the honor of participating

Stem Education: A Leading Approach into Cohesive Learning

Farah Abed Ali, Mirna Reslan and Reem Halawi, Wellspring Learning Community, Beirut, Lebanon

STEM education embraces every field related to Science, Technology, Engineering and Math. Students start STEM education at a very young age. It is obvious that STEM fields affect every aspect of daily life. In STEM education students will be able to use concepts, knowledge and skills learnt in science, technology, engineering and math to solve everyday problems. This approach focuses on hands-on activities to develop students' practical skills rather than just students' knowledge. STEM education helps students become inquirers, critical thinkers and risk-takers. It focuses on the importance of integrating technology in teaching science and math. Participants in this workshop will be able to design and construct their own STEM wiki and website based on their subject of interest to teach a specific topic. The website should be interactive enough to include videos, simulations and animations. As the demand for STEM educators is increasing rapidly according to many recent studies, schools are working on integrating STEM approach into their educational systems and training teachers to shift to such an inquiry approach rather than traditional teaching techniques. Since STEM education in an interdisciplinary approach, it helps build a strong curriculum. In short, STEM education prepares students to deal with everyday problems and prepares them for future economy demands.

1. Introduction:

STEM education includes every field under the umbrella of science; technology, engineering, and mathematics (STEM), everything from chemistry to physics, software design to trigonometry. It is an interdisciplinary applied approach to integrate all subjects mentioned earlier. Stem education takes place throughout all years of learning starting at a very young age. It helps students apply the scientific method acquired in a blended environment to real life.

Due to the rising need for STEM education among the next generation and a way of inspiring our students to be capable in math and science, this will help them contribute in an increasingly technology-based economy. In the STEM website; technology, mathematics and science meet to provide both students and teachers with a collection of videos, interactive simulations, worksheets and activities.

This collection presents mathematical skills integrated in a Chemistry lesson "Acids and bases" using technology tools for example. It includes real-life examples and resources to support cross-curricular work thus aiming at supporting greater student engagement by raising awareness of the applications of STEM in real life.

2. Strategy:

During the session, the participants will be introduced to the approach of STEM education and the importance of its application. The participants will be engaged in open discussions related to the significance and the demands of STEM education. They will get familiar with a previously constructed STEM wiki and later on a STEM website divided as below:

The website is divided into several pages:

- Home page: This includes the aim of constructing the website, as well as a short presentation about each of the STEM group members and the educational philosophy of each.
- Introduction page:
- Members' CV page:
- Acids and Bases page:
- Unit planner page:
- STEM final Project page:
- Wiki STEM titration page:
- Resources page:
- Global Reflection page:
- Group members' roles /Reflection page:
- References and Acknowledgements:

3. Description of session:

The presenters will guide the participants to construct a STEM wiki and website based on their subject of interest. The group will work collaboratively to construct a professional website. This website acts as an educational platform and an effective teaching tool since it is addressed to the students to guide them in their learning process and to teachers as a rich collection of resources. Then each group will be asked to explain their choice of designing the STEM website and how this helps in the student-centered approach during the learning process.

4. Conclusion:

STEM education is a promising tool for approaches in teaching and learning. I widens students' thinking as it integrates different fields together to solve one issue. Students can easily relate learning outcomes to everyday life. Studies done earlier show the increase need for STEM education to fulfill STEM-related jobs. More studies & workshops should be done to further investigate ways to integrate STEM education into the school system and help teachers shift from the traditional teaching approach towards an an inquiry approach through STEM education.

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“Think Out of the Box” Make Your Own Resources of Math “and Science in Preschool

Zaheda Bleibel & Nourhan Habash, Phoenix International School, Beirut, Lebanon

Games are an important tool for learning in preschool and elementary classes. Games give students opportunities to explore fundamental number concepts, such as the counting sequence, one-to-one correspondence, and computation strategies in addition to the real life experiments. Further, they offer opportunities for students to deepen their scientific understanding and reasoning. In this workshop the intended participants will be able to realize the importance of using games in the classroom as well as the necessary information needed to create one.

We will go through the studies done about the importance of games in the classroom (15mn).

We will list old and new games played by us and by our parents and play some of them (15mn).

While playing we will distract the objectives of these games whether they target a science concept, or a mathematical one, which will lead us to discuss the criteria of a good game (already stated in the synopsis) extracted from the participants themselves (45minutes).

The participants then will be divided into groups depending on their number and they will start putting the objective of their own game provided that it will be done from hands on material. I will get some buttons, Ice cream sticks, pipe cleaners, clothespins, yarns, straws, In addition to some resources from the AUB field, like pebbles, leaves, stones, small rocks, sand, sticks, etc… and hopefully you will provide me with felt markers, scissors, UHU sticks, and cardboards if possible(45minutes).

Encouraging the teachers to think out of the box and getting to know the importance of using games in the classroom with students is very important. An engineer in India Arvind Gupta who was a popularizer of science invented more than 700 games made from trash so why can’t we?

Toys and games play a large part in the early development of children, certainly in the more developed countries of the world. In such countries the commercial production of toys is in the league of big business. Toy Fairs are held, both national and international, and the range of toys and games cross international boundaries in their popularity. From the domestic point of view it is probable that, in a family with children, the festive seasons provide the greatest impetus to the giving and receiving of toys and games. This is by no means a new phenomenon. Archeological finds have indicated that toy making existed over 4000 years ago, and many of the toys used at that time are still being used today in one form or another. But, if the school could not provide the classes with too many expensive toys what would the students do? Is it possible that they don’t play?

This workshop aims to:

1. Encouraging thinking out of the box and using resources in hand to make a game

2. setting the scene with regard to toys and games as well as to curriculum development trends and activities particularly at the primary level of education
3. collecting and describing some popular games and play activities that our children engage in
4. analyzing these activities to identify science-Math related cognitive, affective and psychomotor behaviors in them
5. illustrating how a primary science and Math teacher can profitably utilize such games to achieve some of the objectives in the current curriculum in Primary Science and Math
6. giving examples of games and toys which can be used in the teaching of science and Math
7. Stating the benefits of using games?

- Playing games encourages strategic mathematical thinking as students find different strategies for solving problems and deepen their understanding of numbers.
- When played repeatedly, games support students' development of computational fluency.
- Games present opportunities for practice, often without the need for teachers to provide the problems. Teachers can then observe or assess students and work with individuals or small groups of students.
- Games have the potential to allow students to develop familiarity with the number system and with "benchmark numbers" (such as 10s, 100s, and 1000s) and engage in computation practice, building a deeper understanding of operations.
- Games support a school-to-home connection. Parents can learn about their children's mathematical thinking by playing games with them at home.

Few language barriers - an additional benefit becomes evident when children from non-English-speaking backgrounds are involved. The basic structures of some games are common to many cultures, and the procedures of simple games can be quickly learned through observation. Children who are reluctant to participate in other mathematical activities because of language barriers will often join in a game, and so gain access to the mathematical learning as well as engage in structured social interaction.

8. Selecting the right time to use the games? Before , after or during the lessons

9. Stating the Principles that the teacher should take into consideration while using the game in the classroom

- Select the game according to the need and the age group of the class
- Use the game at the proper time
- Arrange the game situation so all participants will be able to play

- Teach the participants the rules of the game before starting
- Have all the materials needed to play in hand
- Participants should know the purpose of playing this game
- If the game is complicated start with a small group

10. Giving examples of some DIY games analysis by using this table

Description of games/ play activity

1-Children construct houses by using sticks and leaves

Associated scientific/Math concepts & themes.

1-Building of models Resilience, weight, counting , pattern

Science or Math skills & processes

1-Measurement of length, size, angle, space. Estimation, prediction, observation & manipulation: classification.

Affective behavior

1-Interest, curiosity, experimenting, appreciation

11. Creating toys one for Math and one for Science by going out and using things from the available resources of the University based on the following criteria:
    - has clear learning objectives merged with gameplay
    - is a valid formative assessment, actionable for teachers
    - includes instruction to guide students toward greater understanding
    - promotes strategic thinking
    - Keep the game completion time short
    - Keep the number of players from two to four, so that turns come around quickly
    - shows multiple representations of the content
    - deeply engages students
    - motivates students to challenge themselves.
    - Planned and organized carefully so that the informality and excitement do not defeat the purpose

A recent study has found that a quarter of teachers surveyed reported that there is no time for free play in their kindergarten classrooms. This sentiment is likely linked to increasing pressure for young children to have a strong foundation in literacy and mathematics in kindergarten and 1st grade, particularly with the implementation of the curriculum.
Consequently, playtime has decreased and has been replaced with academically focused activities and lessons. For instance, one report indicated that for every 30 minutes of free play, many kindergartners are engaged in two to three hours of lessons and test prep.

However, time spent learning foundational skills, especially in mathematics, and time spent playing don’t have to be mutually exclusive. Playing games can give young children opportunities to learn and develop foundational math and Science skills that are aligned with any curriculum.

We have been playing games with our kids since they were two years old. This may sound young, but a game of Memory is something even a young child can enjoy. Playing board games might not seem like a learning activity, but believe me there is a ton of learning that takes place. Don't be disheartened! Remember, what the children ask for is fun learning.

Bringing the World to Classroom

Natasha Habli and Nourhan Al Habash; Makassed Aisha School; Lebanon

High-quality teaching is vital for student success. Exploring elements of effective professional development and leadership is critical for growing and supporting great learners. Gaining experience from local experts in education is not enough. Nowadays, globalization encompasses the rationale for teaching and learning 21st century skills. There is an increasingly demand for interconnected and globalized world, where traditional teaching is being supplemented by new and exciting ways to bring the world into our classroom. Through this workshop, participants will explore the steps to change an ordinary theme unit into international project to rock their old traditional classroom into global dimensional one. Different international projects which were already implemented inside our classrooms will be shared with different evidences from local and international schools. For students, sharing in such international project will develop their global awareness, international collaboration, and will encourage them to see things from different perspectives. These international dimensional projects promote the sharing of resources and can be beneficial for teachers through the exchange of practices, knowledge and expertise.

Our world is changing, and in order to prepare our children for this new world we need to change the way we educate them. Learning in a 21st century elementary school should be significantly different than it was before centuries. In the 21st century, educators must create a curriculum that will help students connect with the world and understand the issues that our world faces. Schools in the 21st century will become nerve centers, a place for teachers and students to connect with those around them and their community. Teachers in this new environment will become less instructors and more orchestrators of information, giving children the ability to turn knowledge into wisdom. Teachers' role is to enable students to learn in relevant, real world 21st century contexts (e.g., through project-based or other applied work) and allows equitable access to quality learning tools, technologies and resources and finally supports expanded community and international involvement in learning, both face-to-face and online. As a step to globalize and internationalize your school you should start implementing international projects that can flip classrooms and expose all the educators inside the school to new experiences and perspectives. The international projects can take you from introducing international work to the curriculum, to embed it within school's culture. Through international work, you will be able to access and link with partner schools from local and around the world, to enhance your curriculum, share projects, ideas, and experiences … in order to prepare your students for life as global citizens. All the international work that you will be doing will aid in your professional development and raise your teaching standards. Similarly, for learners, it will be a window to different cultures and countries, preparing them for life in a global society. Engaging students in international activities increases their attention and focus, motivates them to practice higher-level critical thinking skills and promotes meaningful learning experiences. Instructors who adopt a student-centered approach to instruction increase opportunities for student engagement, which then helps

everyone more successfully, achieve the course's learning objectives through enhancing our unit planners to achieve international dimensions that convey latest learning process.

The participants will be introduced to a procedure that will help them flip any theme into an international globalized theme. They will be introduced to schools online website and how they can find international and local school partners to share ideas, experiences and activities with their learners. Beside that they will be engaging more social media in their work on any international activity that will help instructors and teachers to raise their level of communication to meet the 21st century skills.

The flow of the session will be as follows:

a. Ice breaker activity + participant workshop expectations (15 mins)
- Participants will introduce their names and then they should add a rhyming trait that best tells about their personality
- From the title, the participants will be writing their expectations on the padlet wall.

b. Brainstorming: (10 mins)
Participants will be holding discussion on different pictures that show the vital need to change the traditional way of teaching into modern one that meets the 21st century skills. In addition to that, they will recognize the urge of shifting in the learning process from teacher centered to a student centered and hands on activities. Also, the participants will realize the importance of integrating some social media in the teaching and learning process.

c. Video time(5mins)
Participants will watch a video that shows different facts and statistics about how merging 21st century skills with technology and teaching using internationalized units can enhance our teaching and learners' ability to accept others, solve global problems and be ready for the future.

d. Reflection:(5mins)
Participants will be reflecting on the video using pop up strategy

e. Steps to internationalize and globalize any project:(15mins)
Participants will be given cards including the steps for preparing international project. They will arrange them in groups applying Diamond Strategy arrange the steps of how to do an international project using a ''Diamond strategy''.A feedback will be given on each.

f. Steps to find an international partner using schools online : (10mins)
Introducing the ''schools online'' website and how they can be using it to search and communicate with teachers all over the world.

g. Merging social media in the project (5 mins)
They can merge the skype and padlet walls in the learning process through the international project that they are working on. In this way they can share their work and exchange expertise among local and international partners.

h. Sharing an evidence :(15mins)
The participants will be handed a full international action plan that was implemented last year as an international project with all its steps and evidences from local and international schools.

i. Video:(10 mins)

Participants will be watching a video showing the journey of our students' performance throughout the international project, and how collaborated with local and international partner.

j. Set an action plan (25mins)
   In groups of 5, participants will be setting an action plan for the international project and they will present it.
k. Tweet before you leave:(5mins)
   Participants will be writing their reflection on the workshop in a twitter form.

As a conclusion, in order to educate in the 21st century, teachers need to cultivate and maintain the student's interest in the material by showing how this knowledge applies in the real world. They must also try to increase their student's curiosity, which will help them become lifelong learners. Next they should be flexible with how they teach and give learners the resources to continue learning outside of school. The teacher's touch is the most valuable element in education. Teachers play critical roles in coaching and guiding students through the learning process, nurturing students' interest and confidence as learners. Teachers should seriously consider the claim that they are now undergoing one of the most significant technological revolutions for education since the progression from oral to print and book based teaching. Once they begin to consider the possibilities of the 21st century classroom and engage international projects and activities in the curriculum, our schools become more than just places for preparing students for the next level of education. They become places where we truly prepare students for lifelong success and personal fulfillment.

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Innovative Idea Sessions

Personalization Using Flipped Learning

Fatme Charafeddine, Al Bayan Bilingual School, Kuwait.

The aim of this workshop is to introduce participants to the flipped blended learning model and explain how it can be used as a path to personalization. The workshop will explore the benefits of using this model as a way to create a more engaging, inquiry-based, 21st century learning environment; leaving more room for hands-on activities, personalization and improved student-teacher relationship building. Participants will also be introduced to basic tools and technologies that can be used to implement the model. In addition, participants will be able to see the effects of the learning model first hand as they take the roles of both students and teachers and engage in a modeling-based collaborative, hands-on learning experience. Participants will create video-based artifacts of their learning and share their findings in a whole-group discussion.

Introduction:

Students are learning very differently now because of technology. We live in a world where information is so widespread and easily accessible that it has become essential to teach students how to access appropriate knowledge rather than hand it to them. As science educators, our roles are changing and evolving. We are no longer the authoritative providers of knowledge, but rather the encouraging supportive facilitators in our students' personalized learning journey.

One of the biggest challenges that the majority of our learning environments currently face is the notion that we are still stuck in this traditional, one-size fits all 19th century classroom despite the 21st, advanced technological world we are fast-approaching. Indeed, technology's potential as a tool for improving science education and personalization within the classroom has been a focal point for many. Blended learning models in particular incorporate technology as a key component for reaching specified goals (Horn & Staker, 2015).

Often as science educators, we find ourselves wanting to incorporate personalization into a traditional teaching model, but are faced with challenges because the majority of the face-to-face time we have with the students is spent on lecture. In fact, almost 90% of class time is often spent with information delivery, leaving very little time for individualized, personalized learning, as well as relationship and 21st century skill building. Presenting content to a whole class through traditional lectures, leaves very little room for flexibility in learning pace, location or method. So this leaves the question, what is the best use of face-to-face time with students? One blended learning model, the flipped learning model, aims to consider and answer this question by allowing instructors to maximize the value of in-class time (Bergmann & Sams, 2014) and make more room for personalization.

Strategy:

The flipped learning model has great potential for supporting student-centered learning in sciences and can enable teachers to engage in more individualized, differentiated and personalized instruction using resources readily available to them, while also building relationships with students and improving mastery and competencies.

Description of Session:

This workshop will model an efficient and active learning environment. The workshop will begin with a comparison between a classroom in the 1950s and a modern day classroom followed by a discussion of any noticeable differences and problems. Blended learning, specifically flipped learning, and technology use will be introduced as a solution to this problem and a tool for personalization. Flipped learning will be briefly defined, followed by a video comparison of a traditional versus a flipped classroom. Participants will brainstorm and present differences that are noticed between the two methods of class-time content delivery. Next, a brief addressing of misconceptions regarding what flipped learning is and is not will allow participants to gain further understanding regarding the definitions and concepts involved. In addition, a brief discussion of how flipped learning can support personalization will be addressed. This will be followed by a very brief how-to description of flipping a lesson and an introduction to tools and technologies available to allow for efficient flipping. I will not go into too much details regarding this part due to time constraints, because this workshop is more about introducing the learning model rather than a how-to guide of implementing the model. However, I will direct participants to a Google Docs page created with a detailed step-by-step how to guide to flipping a lesson with a full description of tools and technologies available that they may access at their own time. Participants will then model being students in a flipped learning environment as they watch an EDPuzzle video by Jon Bergmann, one of the pioneers of the flipped classroom movement, further explaining what flipped learning really is. The video will include embedded guided-viewing questions that will open up a chance for further discussions of best practices and ways the learning model could be applied within the classroom.

The participants will then be grouped and will take the role of students, watching short, 5 minute videos summarizing additional topics related to the flipped learning model including: supporting personalized learning with a flipped model, variations on the theme, additional benefits, and criticisms and drawbacks. The mini video lectures are created ahead of time and include the lecture content intended to be covered during the workshop. Not only are the video lectures 80% shorter than live lectures with the same information, they also help to create a self-paced learning environment, modeling what flipper-learning videos are all about. Participants can review the video lecture contents again at their convenience once the session is over to reinforce the

information. These videos allow more time to be spent encouraging participant collaboration and hands-on active learning.

Using the jigsaw method, each group will focus on one topic. The participants will be challenged to answer questions, collaborate, engage in hands-on activities and create one-take video artifacts of their learning. The participants will then share their findings by presenting the video artifacts created so that everyone can gain knowledge about all the topics explored. Finally, the participants will be re-engaged with a whole group discussion regarding how this model can be used to enhance their own instruction. Any further questions will be addressed. These model lessons and discussions ensure that participants leave the workshop with a deep understanding of the flipped learning model, both from a teacher and student perspective.

Conclusion:

Flipping a class is a way to support student-centered learning and can enable an individualization and personalized instruction. This blended learning method can be used by science instructors to allow them to become better, more efficient, 21st century educators and give them the option to spend more precious face-to-face in class time with students focusing on more engaging, inquiry based learning activities including labs, demonstrations and collaborative learning techniques. This workshop aimed to introduce teachers to the filled learning model, as well as explain how it can be used as a path to personalization. Building on to this workshop, it would be useful to provide a more detailed, step-by-step approach to the actual implementation of the model, as well as discuss the different variations of the model that can be adapted depending on subject area and instructor preferences. Given the plethora of technological websites, applications and programs available, it would be useful to provide further training on how to use these different methods to help with flipping a subject or class.

Workshop Overview

Time	***Description***
5 min	Introduction of presenter and topic This will be done with a brief one-take paper slide video. This will be a way to model a product that participants will work on later on in the workshop.
10 min	Traditional vs. flipped classroom compare and contrast + discussion
5 min	The Flipped Classroom overview + brief tool summary
5 min	Modeling the at-home video or "share/host" component of the flipped classroom using the video "*Jon Bergman- Flipped Learning*" on Edpuzzle. Participants watch video and are asked to answer questions.
5 min	Participants model the "group" component of the flipped classroom and discuss answers. One person is asked to be the note-taker, one person is asked to be the designated presenter. The note-taker adds their main points of discussion into a Google Docs page.
5 min	Participants model the "regroup" component of the flipped classroom. The group representative discusses their group's main points that were discussed and added to the Google Docs page.

5 min	Participants are asked to read "Flipped Learning: a How-to Guide to Personalized Learning.
20 min	To model the "plan" and "record" components of the flipped classroom, participants are asked, in groups, to create one-take videos summarizing their learning that are no longer than 5 minutes in length. Participants are given the opportunity to re-teach to me what they learned re-enforcing and solidifying knowledge.
15 min	Each group will present their videos. We will wrap up the workshop with a whole-group discussion to address any additional comments or questions.

Note:

** It is important that participants bring their laptops or devices to this workshop. Access to Google Drive is also preferable.

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"Blended learning", a new promising approach

Sarwa Alakkad Hankir and Jana Abou Orm Rawass, Houssam Eddine Hariri High School_ Saida, Lebanon

Nowadays, our students who are born in the digital age are using the digital language. Technology has become the most popular topic in education and the tool that fosters students' learning. Educators should be aware of the 21st century teaching approaches that facilitate student' learning and help them succeed. "Blended Learning "is the approach that promises the integration of technology and the use of the 21st century skills in our classrooms. It's an experience that generates a great interest in making online learning available to students. Through it, students will have the ability to be engaged in learning their studies at times that suit them best. The success of learning is enabled through the "Blended Learning" approach. Therefore, the purpose of this workshop is to introduce the topic "Blended Learning" and its positive impact on students' learning. This workshop will highlight the role of educators and students in this learning environment. Since we believe there is much to discover and to unleash blended learning which is a powerful tool that would aid students in the 21st century, why don't we give it a try?!

Introduction:

Students are facing their smart phones, tablets, laptops, and even smart watches almost all the times. They just need to click in order to get the information. Therefore, to ensure the success of students' learning in this digital age, educators should blend face to face instruction with online learning experience.

Strategies:

This workshop combines inspiring videos, brainstorming techniques, icebreaking activities, collaborative work and reflection activities to serve the same objective.

Flow of the session: (75 min)

1- Start with an icebreaking activity: divide the participants into groups of 4 based on the subject they teach and ask them to search for the definitions of different terms using their phones.
2- Conclude the importance of technology gadgets in the learning process.
3- Link this conclusion to our students who are so attached to their phones.
4- In groups, participants think of the definition of "blended learning".
5- Attendees watch a video to reflect on their written definition.
6- Use the power point presentation to show the importance of "blended learning "
7- Provide the attendees with examples on implementing "blended learning "in science classroom.
8- Ask attendees to extend the previous step through preparing their own unit plan using "blended learning" approach.
9- Discuss the challenges that educators might face when using "blended learning ".
10- Finally, all the attendees reflect on the workshop through the "emoji" activity.

Conclusion:

Blended learning is an approach that should be used wisely by educators. It is better implemented when educators recognize that some material can be delivered better by combining face to face sessions with online learning. Blended learning develops students' positive attitudes toward science, improves their thinking skills, and deepens their understanding.

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Chemistry in cards

Dima Mortada, Beirut Baptist School, Beirut, Lebanon

Do you think you can get rid of chalks and boards? Did you ever imagine revising or assessing your chemistry lesson through games? Do you think you can integrate education with fun? It's time to give your students the opportunity to enjoy and play with Chemistry so let's put it in Cards!! This workshop tackles the topic of how schools are shifting toward project-based learning and cooperative learning as a way of increasing engagement and creativity in the classroom. This workshop is going to show how students and teachers play an equal role in the learning process through various learning strategies that develop students' deep understanding and analysis skills with the integration of innovative and creative activities.

Revising or assessing students' understanding could be one of the hardest tasks a teacher has to face. Some double faced actions will be presented in which both, students and teachers, will benefit. This workshop is going to show how students and teachers play an equal role in the learning process through various learning strategies (project-based learning and cooperative learning) that develop students' deep understanding and analysis skills with the integration of innovative and creative activities.

All students (participants) should know the following:

- The periodic table is a chart containing information about the atoms that make up all matter.
- An element is a substance made up of only one type of atom.
- The atomic number of an atom is equal to the number of protons in its nucleus.
- The number of electrons surrounding the nucleus of an atom is equal to the number of protons in its nucleus.
- Different atoms of the same element can have a different number of neutrons.
- The atomic mass of an element is the average mass of the different isotopes of the element.
- The atoms in the periodic table are arranged to show characteristics and relationships between atoms and groups of atoms.
- A periodic table has seven horizontal rows/periods and 18 vertical columns (8 groups and 10 subgroups).
- In the periodic table, there are metals, non-metals and metalloids.
- Electron configuration is the distribution of electrons on energy levels: K2, L8, M8, N32 .
- The different families of columns: column one= alkali metals, column two= alkaline earth metals, column 17= halogens, column 18= noble gases.

<u>1st activity: (20 min)</u>

Participants, in pairs, will have a copy of the periodic table (optional) and 20 cards, each representing an element from the first 20 ones. Different characteristics will be used for different elements (Z=1, 1st column 2nd row, e= 6, 2nd group 3rd row, K2L8M3…). They have to

identify the names of elements, their symbols, and then post the cards on a cardboard which will be graded by the teacher. One cardboard will be assessed.
In this activity, students will revise almost all the objectives needed in the periodic table lesson and the teacher will assess their understanding in an indirect and active way!

2nd activity: (25 min)

Participants begin to look closely at the periodic table that will be projected on the board or distributed to each group (optional). They will focus on the first 20 elements. There will be 100 cards (5 for each of the first 20 elements). Each card contains information about one of the first 20 atoms of the periodic table. The participants will be divided to groups where each one will have at least 20 cards. As a competition, each group will read a card loudly in which other groups should identify the atom being represented to gain one point and if they show another card for this atom they will get two points. After 4 rounds, the points will be counted for each group to announce the winner.
This activity will engage students more in the learning process and increase their interest in this lesson specifically and Chemistry in general.

3rd activity: (20 min)

The same cards of the second activity will be used but in different way. The participants will be divided to groups as well, their job is to read each card carefully, figure out which atom the card is describing, and classify them on a cardboard that the teacher can assess. Two or three atoms will be selected and reviewed to check whether the cards were placed correctly. This review will help reinforce the concepts about the structure of atoms and help students determine the number of protons, electrons, and neutrons in each type of atom.
To end the session, participants will watch a video "Meet the Elements".
Extend!! (10min)

- Assign each student to an element. Include the first 20 elements and any other elements that you find interesting so that each student can research and present their own. Each student should find and present some basic information about their element to the class. The presentation can be in the form of a poster, PowerPoint presentation or other form. The presentations should be short and can include: atom name, atomic number, derivation of name, when and where discovered, natural sources of the element, major uses, and any other information you find important.
- Each student should form a cube each side will show a certain information about an atom:
    - ✓ Name
    - ✓ Symbol
    - ✓ In which column and row
    - ✓ A picture of a substance made up of this atom
    - ✓ Its electron configuration
    - ✓ Metal/non-metal/ or metalloids
    - ✓ Any other info is accepted.

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Involve me and I understand chemistry

Maha Shebly and Wardeh El Rabih, Houssam Eddine Hariri High School – Saida – Lebanon

Chemistry is different from any other subject. One has to look beyond the books and conventional classroom teaching to understand its concepts. Effective teaching and learning of chemistry involves seeing, handling, manipulating real objects and material and understanding the relationship between action and reaction.

Hands-on laboratory chemistry experiences are significant in the learning process. They vary from guided to open labs where students collect data, experiment and test their own hypotheses. Moreover, properly designed experiences consist of material that range from the simplest ones to Web-based(simulations), and to computer-simulated activities (EXAO).Students who are engaged in well-designed experiences develop better problem-solving and critical thinking skills.

Our workshop aims at targeting teachers who want to develop the problem-solving and critical thinking skills of their students through different interactive lab experiences. Participants will have the chance to encounter lab experiences across different levels, to reflect on these labs and to write a scientific method report.

"Tell me and I forget, show me and I remember, involve me and I understand." What Benjamin Franklin said is what we aspire as we design our sessions that would mold long life learners!

- **Title: Involve me and I understand chemistry**

  Science-in particular Chemistry- is different from any other subject. In order to understand its concepts, laboratory experiences are highly needed. *The learning goals of these laboratory experiences should include developing scientific reasoning abilities and practical skills, cultivating interest in science learning, and improving teamwork abilities.* These goals are more likely to be achieved if these experiences are designed in a clear way, sequenced in the flow of the classroom instruction, and incorporate ongoing students' reflections and discussions. This workshop targets teachers willing to achieve these learning goals. Putting themselves in the shoes of the young learners, participants will be engaged in different activities that foster learning and understanding of different types of laboratory experiences. Enough time will be given to the participants to share their reflections.

This session is planned as following:

a) Get **familiar** with each other and discuss the **expectations** of the participants**. (5min)**

b) Brief introduction to the objectives of the workshop. **(5 min)**

c) Classification of lab based on different criteria:

✓ **Criterion 1: Usage of the lab through the learning process: (10 minutes)**

- Participants will fill cards tackling this criterion.
- Through a PowerPoint presentation, different examples from different grade levels will be provided to the participants.
- Lab is used:
    - As an introduction to the concept.
    - Reinforcement of the concept (ongoing learning process)
    - As an assessment of the concept (**based on a lab work rubric, lab report or scientific method report)**

✓ **Criterion 2: According to students' involvement: (10 min)**

- Participants will fill cards tackling this criterion.
- PowerPoint slides to be presented showing the difference between the different kinds of labs.
    - Guided lab
    - Structured lab
    - Open lab

- **Activity 1: (5 min)**
    - Three different manuals for:" The separation of mixtures- Grade 7" will be provided to the participants.
    - They will classify them into guided, structured and open and justify their choices.

The audience will be divided into 3 groups, each will group will perform one of the following activities : (Activity 2, Activity 3 and Activity 4) (15 minutes)

- **Activity 2:**
    - Taking the role of the students, the participants, will conduct a guided lab for:" The separation of mixtures: Grade 7"
    - The participants will write the **lab work rubric** for the evaluation of the **students' work** throughout this lab.

- **Activity 3:**
    - Participants will fill a lab report for the structured lab for "The separation techniques".
    - Participants, taking the role of the teacher, will evaluate this lab report based on a given **lab report rubric.**
    - Suggestions for any modification (reflection) for the **lab report template** and **its rubric** will be displayed on the wall of the workshop arena.

- **Activity 4:**
    - Participants will fill a **scientific method report** for the open lab.
    - Suggestions for any modification (reflection) for the **scientific method report template** will be displayed on the wall of the workshop arena.

✓ **Criterion 3: Based on the material used:**

- A brief definition of each kind will be introduced. **(5min)**
  1- Demonstrati**on (dangerous material or limited amount of needed material).**
  2- Group work.
  3- Lab Simulations
  4- Computerized Lab using EXAO.

- A demonstration experiment will be performed (Grade 9 and 10 level: Violent reaction of alkali metal with water) **(5 min)**
- A brief group work will be performed to test the different properties of the metals in the periodic table (grade 8,9 and 10 level) **(10 min)**
- Note that: "3" and "4" will be discussed in details in another workshop that will be held on the same day.
- **Ending this session: (5 min)**
    - Teachers' reflection on the workshop using post cards.

Workshop evaluation.

Scenario Based Learning

Widad Al Barraj and Ghada Chamandi, Houssam Eddine Hariri High School – Saida - Lebanon.

Barbara Hardy, a British scholar, author and poet, once wrote, "We dream in narrative, remember, and hope in narrative….". Humanity has been forever seeking a way to retain information. This is due to the fact that humans aspire for their discoveries to be remembered through authentic and realistic experiences. As a result, narratives were adopted as approaches to communicate and understand what is going on around us. Since understanding and memory are intertwined, we shouldn't be surprised that they are also very powerful reminders. Stories also make learning connections easier for they make what happens next feel like it is inevitable. The ultimate goal of any educator is to contribute in the molding of a student with a life-long subject based knowledge. In this innovative session we will share with you through interactive activities how Biology, a science discipline, is assessed better through narration. We will also provide you with evidence on how the scenario based assessment strategies affect students' intellectual development and learning process.

Scenario-based learning (SBL) uses scenarios to support learning strategies such as problem-based or case-based learning. Learning best takes place in the context where it is going to be used. It involves students working their way through a storyline, usually based around a real-life case study. They are encouraged to play active role by using their subject knowledge, critical thinking and problem solving skills in real-world environment. Participants will identify the importance of scenarios in addressing the curiosity of students and help them connect to real life cases.

This session is planned as following:

a) Introduce ourselves. **(2 min)**

b) Brief introduction to the objectives of the workshop. **(5 min)**

A: Introducing the idea

Activity 1: Scenarios everywhere (Ice breaker) **(15 min)**

Part A:

- Participants are asked to move to the sound of music
- As the music stops each participant stops facing another participant where they should act like they know each other and communicate through sharing an incident that happened in their life recently.
- Select some of the pairs to share the incidents told during this activity

Part B:

- Different resources (stories, DVD covers, tests, biology books, …) are set aside on a table where participants are asked to choose a resource that grabs their attention the most and add pleasure to their days.
- Participants are given time to discuss their preferences among each other.
- They have to state what's the common factor among all those and why do people enjoy these.
- They are also asked to select the odd resources and explain their choice.
- Discussion is done to identify the importance of real life scenarios.

B: Scenario based learning methodology:

- Through a power point, participants will get introduced to:
    - Definition of Scenario based learning strategy (5min)
    - Importance of scenario based learning (5min)
    - Steps of designing a scenario based learning experience (5min)
    - Different ways of involving it in the teaching process
        - Self-contained: Sample application is discussed (10min)
        - Activity: Sample application is discussed (10min)
        - Summative assessment for a set of concepts in a unit: Sample application is discussed (10min)
    - Assessment: (rubrics) (5min)
    - Results of statistics done on our students' feedback regarding their opinions about this strategy.(5min)
- **Activity : let's apply** (10 min)
  Participants are divided into groups of three.
  Each group will be supplied by different science concepts and documents and are asked to design a scenario based experience for a specific grade level.
  Results are discussed.
- **Ending this session: (5 min)**
    - Teachers' reflection on the workshop using post cards.
    - Workshop evaluation.

Personalizing Learning through Adaptive Technology

Muhammad Jeenah, Houghton Mifflin Harcourt, United Arab Emirates

Incorporating technology into classrooms and schools has been a global focus over the past decade. Laptops, tablets, projectors you name it schools today have them. Expect now that we have all of these "tools" in the hands of students and teachers we are now starting to thinking about how exactly are the "tools" moving the learning forward. Is having a tablet merely just a replacement of worksheets? In most cases if not all that seems to be the case. Teachers are uploading very traditional worksheets to learning management systems and serves. We have once again failed to enhance the pedagogy. Until now that is! The trend for a personalized learning experience for students is set to increasingly impact our profession over the next decade. This will be provided by adaptive and optimized learning environments. Adoptive technology uses algorithms to personalize content for each student. This technology is probably the most exciting advancement in mathematics education today! During this session participants will gain insight into adaptive learning tools that are personalising the learning experience for mathematics students. They will also have the opportunity to experience the power of this technology first hand through activities set by the presenter and hence engage in intervention and enrichment adapted by the Personal Math Trainer.

Introduction

Incorporating technology into classrooms and schools has been a global focus over the past decade. Laptops, tablets, projectors you name it schools today have them. Expect now that we have all of these "tools" in the hands of students and teachers we are starting to thinking about how exactly are the "tools" moving the learning forward. Is having a tablet merely just a replacement of worksheets? In most cases if not all that seems to be the case. Teachers are uploading very traditional worksheets to learning management systems and serves. We have once again failed to enhance the pedagogy. Until now that is!

The trend for a personalised learning experience for students is set to increasingly impact our profession over the next decade. This will be provided by adaptive and optimised learning environments. Adoptive technology uses algorithms to personalise content for each student. This technology is probably the most exciting advancement in mathematics education today!

During this session the participants will gain insight into adaptive learning tools that are personalising the learning experience for mathematics students. They will also have the opportunity to experience the power of this technology first hand through activities set by the presenter and hence engage in intervention and enrichment adapted by the Personal Math Trainer.

Strategy

The presenter will promote the need to create a personalised learning experience for each student in the mathematics classroom. The need for instruction to be student centred and for teachers to find innovative methods to reach all student's needs.

Description of session

Introduction to adaptive technology:

The presenter will introduce and discuss the importance to use the latest tools to enhance the learning experience for students. The need to go beyond e-books and online resources. Participants will watch a short video highlighting the advancements made by technology in the world today and the lack of transformation in education. The participants will be introduced to "adaptive technology" available with the Houghton Mifflin Harcourt Go Math series through the Personal Math Trainer. They will discuss the pedagogical shifts that this technology will require and the new role of the teacher.

Participant Involvement Level (2/5)

Silent brainstorming session:

During this activity the participants will work in groups. Each group will be given a chart sheet and a few markers. The presenter will display, words phrases and pictures on the screen. As these are displayed the participants in their groups will use the markers on the chart sheet to document any thoughts ideas or questions that come to mind. Participants will be encouraged to comment and question their group member's recordings. This is a silent session hence group member may only communicate through the chart sheet.

Participant Involvement Level (5/5)

Experience the technology:

Participants will work in groups. The presenter will distribute usernames and passwords to the groups and assist them in accessing the Houghton Mifflin Harcourt Think Central platform. The presenter will assign an activity online to the groups. The groups will complete the activity online and submit once completed. Participants will have the opportunity to explore the Personal Math Trainer, the virtual manipulatives, the intervention and enrichment components.

Participants will experience first-hand how the technology adapts to each individual student's needs. This will allow them to truly understand how powerful technology can be used to enhance the way students experience and engage in mathematics concepts.

Participant Involvement Level (5/5)

Five-word summary:

Each group will be asked to share a five words summary on their experience.

Participant Involvement Level (5/5)

Sharing Ideas and Questions:

Participants will be given the opportunity to share ideas on how they see the adoptive technology impacting mathematics instruction, student engagement and the teaching of mathematics.

Participant Involvement Level (5/5)

Conclusion

We have grappled with the ideas of technology in education for some time. Some for and some against the shift. Today we finally see how technology will be able to truly give teachers the power to enhance the learning experience for each student. Adaptive technology has and will challenge existing norms in Mathematics Education.

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Learning Activities based on the Multiple Intelligences Theory

Rima Amacha, Ahliah School, Lebanon

Teaching mathematics requires various teaching strategies to ensure a solid understanding of concepts. This session deals with learning activities based on the multiple intelligence theory by Howard Gardner that differentiates between many learning styles based on eight different types of intelligences, the musical-rhythmic, visual-spatial, verbal-linguistic, logical-mathematical, bodily-kinesthetic, interpersonal, intrapersonal, and naturalistic. The primary objectives of this session are to: - keep participants up to date with the theory of multiple intelligences and its implementation in the classroom, - Give participants some tools in education that can be helpful in their teaching – Highlight the connection between mathematics and multiple intelligences regarding students' achievement. - Use mathematics in raising students' awareness towards several social issues. This session focuses on specific types of intelligences that can be implemented in the classroom. The theory will be explained to participants who will discover their own strong intelligences by answering a questionnaire. Participants will be engaged in suggesting, preparing, discussing and presenting learning activities based on the different types of intelligences, these activities target mathematics objectives in middle school. An extension will be proposed and discussed about activities that combine mathematics and sciences.

Introduction:

Teaching is one of the most difficult things to do because it is all about dealing with human minds. As complex as they are, human minds receive information in different ways according to different backgrounds and experiences and even different surroundings. From here, comes the importance of studying the different kinds of intelligences through which a human being is able to receive, decode, understand, apply and analyze information. In order to be successful in teaching, a teacher has to improve his abilities to address to all students' thinking as different as they may be.

However, each student comes to a classroom as an individual who has developed a different type of intelligence. This means that each student has their own intelligence superiorities and weaknesses. These intelligences domains determine how easily or difficultly a student can learn through a specific teaching method. This is called a "learning style". There can be more than one learning style present in a classroom. However, a teacher should show students how to understand a subject which indeed addresses one of their weak intelligence domains by applying their most developed intelligence domain. For instance; a student who has highly-developed musical intelligence can be asked to learn about a war and what happened during that war by making up a song about it. (Temur, 2007)

A teacher nowadays should search for activities based on different types of intelligences in order to reach the maximum number of students. The purpose of this session is to give teachers an overview of the different intelligences through which a teacher can address a mathematics objective in the middle school, based on students' intelligences and interests. The session is based

on the Multiple Intelligences Theory by Howard Gardner in addition to the proposer's own experience; Moreover, the proposer will present some ideas for preset activities and will give some useful tips for teachers when searching for, preparing, or setting an activity based on the discussed types of intelligences. Participants will be engaged in preparing activities based on students' different intelligences and interests.

Strategy:

The session includes many interactive activities starting with a multiple intelligences quiz by which every participant assesses his own types of intelligences; This activity helps participants identify their own intelligences so that they can help their students discover their strong intelligences fields; This will give teachers the opportunity to address an objective in the most convenient way for each student or group of students. After that, groups sharing common intelligences will work together on mathematics activities highlighting the field in which their intelligence is the strongest. This will show participants how to benefit from common interest and intelligence field in creating the best outcomes. By applying this strategy in the classroom, a teacher can help his students develop their intelligences not only through working with classmates sharing the same type of intelligence, also through seeing the same objective from different perspectives by communicating with other groups and sharing outcomes. This will help a student finding connections between different skills, and these connections will lead to a better understanding of concepts. Moreover, a student will be more familiar with mathematics concepts by seeing the reflection of his own strength on what he is learning, which will make a hard subject more reachable.

During the session, many discussions will take place so that participants use a common language for the different types of intelligences that the session will focus on. Throughout the introduction, participants will learn about the needs and the behavior of a person having a remarkable field of intelligence. Different active learning styles will be introduced all based on the multiple intelligences theory. Participants will engage in group work activities with a single outcome per group and other pair work and group work activities with a global outcome for all the groups where each group works on a part of the final project. The project will cover a single math topic from different perspectives (as seen by a student with verbal intelligence, musical intelligence... etc.)

This strategy will highlight the importance of all types of intelligences grouped together in one outcome and give chance to participants (or students) to use their strong field of intelligence as well as developing other fields of intelligence that are less strong.

Although learning activities will be applied on mathematics objectives, they also shall raise awareness of students in many social fields. Also, the proposer will be emphasizing on the importance of interconnecting fields (mathematics and sciences mainly)

Description of session:

Activity 1: Expectations and introduction

Allocated time: 10 minutes

Participants will share their expectations based on the title of the session and will tell why they were interested in attending it.

The proposer will introduce the multiple intelligences theory and why he thinks it is useful in teaching mathematics in middle schools through a PowerPoint presentation in which each type of intelligence is discussed with the needs and the and then participants will be asked if they're applying any of the intelligences in their classroom. Throughout this introduction, the proposer will emphasize on the importance of searching for good references to stay up to date in all educational issues and to learn how to overcome all new challenges.

The proposer presents different examples from his own experience and his students' work for different types of intelligences: Body-kinesthetic intelligence: applied for the objective: Finding the locus of a variable point that is moving at a constant distance from a fixed point. Students will trace the variable points by walking around a fixed person keeping the constant distance. Students' will conjecture the locus property by observing the trajectory drawn by their own steps. (Picture 1*)

Another example is based on the interpersonal intelligence connected to the visual intelligence where students have to go for researches on the interconnections between the lesson "Powers" and its real life applications. (Picture 2*) and a third example for the same lesson, to develop the verbal - linguistic intelligence, students were asked to search in references for the history of powers and to present it for their colleagues (Picture 3*). Other examples that point to the needs of students for activities that are closer to their interests will be shown (videos, letters, questionnaires…)

Participants' involvement: discussion

*Pictures are added to last page

Activity 2: Multiple Intelligences quiz

Allocated time: 10 minutes

Participants are asked to do an international quiz prepared to test the different types of intelligences that a person has. The proposer will work on the curiosity of participants to encourage them to answer a questionnaire: few direct questions (Yes/No questions – Likert Scale), that will help in determining their own type of intelligence and will encourage them to do the same with their students with a quiz that is suitable for their age level (the quiz for middle school students will be presented)

PS. The selected questions will exclude the logical mathematical intelligence from the test because all math teachers are expected to have a strong logical mathematical intelligence

Participants' involvement: individual work

Activity 3: Mathematics activities

Allocated time: 35 min. as follows

5 min: Explanation of the required work; 15 min: group work; 15 min: presentation

Participants will form groups sharing a similar type of intelligence (musical, body kinesthetic, visual, interpersonal …) and each group will be asked to select a mathematics objective and create a learning activity based on their type of intelligence by which they will present their objective to other groups at the end of the activity.

Each group will present their activity and other groups will be asked for suggestions regarding the outcome.

Participants' involvement: Group work/ discussion

Activity 4: A Global Project: Math Magazine

Allocated time: 20 min as follows

5 min: Guidelines; 10 min: group work; 5 min: presentation

In this activity, participants are asked to choose a topic in math, assign tasks that cover different types of intelligences and to relate each task to a special type of intelligence. Each group is asked to fill in a chart with tasks prepared for groups of two students. Tasks should cover all the objectives of the topic for a grade level and they should vary as in a magazine (history section, images, real life situations, interviews, statistics, fun zone, songs, decorations…)

The proposer explains that when this activity is applied in a classroom. Each pair or group of students will be responsible of one section in the magazine. Example: A student (group) who gets the task to write a song (student with musical/rhythmic intelligence) is asked to write the rule of the topic in a song), a student (group) who gets the task to prepare the history section (student with verbal/linguistic intelligence) is asked to present the history of the topic and/or to introduce it. A student (group) who gets the interviews section (student with interpersonal intelligence) is asked to interview students and teachers about the common mistakes in this topic and how to avoid them, and many other examples (mind maps, charts, models..)

The proposer explains that this project can be used as a part of an assessment of the topic and shows an example of a math magazine done by his students.

Participants' involvement: Group work/ Discussion

Session closure (5 min)

Participants are asked about their feedback, their suggestions and their comments.

Conclusion: A teacher who is always up to date in all trends in education is a teacher who meets students' expectations and who is transmitting the message the way it should be delivered. Teaching has a wide range of challenges for which a teacher should always be ready to face. This session is to give teachers a variety of activities that may have a good influence on the teaching-learning process.

Our aim is to provide tools that make facing and overcoming the big challenges possible, without losing the key concept of the material.

The multiple intelligences theory:

"The **theory of multiple intelligences** differentiates intelligence into specific (primarily sensory) 'modalities', rather than seeing intelligence as dominated by a single general ability. Howard Gardner proposed this model in his 1983 book *Frames of Mind: The Theory of Multiple Intelligences*. According to Gardner, an intelligence must fulfill eight criteria: potential for brain isolation by brain damage, place in evolutionary history, presence of core operations, susceptibility to encoding (symbolic expression), a distinct developmental progression, the existence of savants, prodigies and other exceptional people, and support from experimental psychology and psychometric findings. Gardner chose eight abilities that he held to meet these criteria: musical-rhythmic, visual-spatial, verbal-linguistic, logical-mathematical, bodily-kinesthetic, interpersonal, intrapersonal, and naturalistic."

However, not all the intelligences mentioned in the theory will be applied during the session. Also, participants will be told that addressing a specific type of intelligence doesn't mean ignoring other types because our aim is to reach students' minds as well as developing their skills

References:

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Project Report Sessions

دور مبرة السعد في التنمية المهنية عبر صقل مهارات معلمات العلوم والرياضيات والتكنولوجيا لتمكين الفتاة الكويتية والعربية

د. فاطمة محمد الهاشم ، مدير إدارة تنمية المعلم، المركز الوطني لتطوير التعليم، مدير عام مبادرة ابتكار الكويت، مبرة السعد للمعرفة و البحث العلمي، دولة الكويت

إن مسألة التربية والتعليم ليست محصورة بوزارة التربية والتعليم فقط، إنما هي مسؤولية تضامنية يتشارك بها العديد من مؤسسات المجتمع المدني نحو بناء أفراد قادرين على تولي المسؤولية نحو أنفسهم ووطنهم، وعليه تأتي أهمية مشاركة المؤسسات الأهلية والمبرات الخيرية وغيرها من المؤسسات في دعم العملية التربوية سواء في تقديم الدعم المادي أو إقامة الأنشطة المختلفة والمشاريع البناءة. من هنا يأتي دور مبرة السعد للمعرفة والبحث العملي نحو دفع مسيرة البحث العلمي عبرة أحد مبادراتها "مبادرة ابتكار الكويت لأبحاث ومشاريع الطالبات" والتي تهدف بشكل أساسي إلى تنمية قدرات طالبات التعليم العام في المجال العملي سواء على الصعيد المحلي أو على المستوى الإقليمي. و تتولى المبادرة بتوفير الدعم التدريبي لكل من المعلمات و الطالبات المشاركات قبل أن تتأهل المتسابقات للدخول في المنافسة عبر برامج تدريبية من أكاديميين أكفاء من دلة لبنان الشقيقة ودولة الكويت.

المقدمة:

إن مسألة التربية والتعليم ليست محصورة بوزارة التربية والتعليم فقط، إنما هي مسؤولية تضامنية يتشارك بها العديد من مؤسسات المجتمع المدني نحو بناء أفراد قادرين على تولي المسؤولية نحو أنفسهم ووطنهم، وعليه تأتي أهمية مشاركة المؤسسات الأهلية والمبرات الخيرية وغيرها من المؤسسات في دعم العملية التربوية سواء في تقديم الدعم المادي أو إقامة الأنشطة المختلفة والمشاريع البناءة. من هنا يأتي دور مبرة السعد للمعرفة والبحث العملي نحو دفع مسيرة البحث العلمي عبرة أحد مبادراتها "مبادرة ابتكار الكويت لأبحاث ومشاريع الطالبات" والتي تهدف بشكل أساسي إلى تنمية قدرات طالبات التعليم العام في المجال العملي سواء على الصعيد المحلي أو على المستوى الإقليمي. لقد بدأت مسيرة مبادرة ابتكار الكويت لأبحاث ومشاريع الطالبات في بداية سنة 2000 عبر مسابقة "سعادة الشيخة فادية سعد العبدالله الصباح" وكانت محصورة على المرحلة الثانوية في دولة الكويت فقط، ومن ثم تطورت مع الوقت لتصبح على مستوى إقليمي في العام 2006. انتهجت المسابقة نهجا جديدا في منتصف سنة 2015، و تم إعادة صياغة الأهداف لتكون كالتالي:

- تنمية روح البحث العلمي
- خلق روح العمل الجماعي والتعاوني
- تنمية حسن الولاء الوطني بدعم المشاريع التي تخدم المجتمع.
- تشجيع الفتيات على التميز بالتخصصات العلمية.
- استدامة المعرفة عبر الدخول في سلسلة من الدورات التدريبية من قبل اختصاصيين في مجال كل نوع للمسابقة.

وعليه تم إعادة بلورة المسابقة لتشمل المراحل التعليمية الثلاث، وتشمل أيضا برامج تدريبية على المستوى المحلي لكل من الطالبات المشاركات ومعلماتهن. وعلى هذا النهج تم وضع منهجية لتحقيق الأهداف المنشودة من خلال ثلاثة عناصر أساسية:

- أن يكون موضوع المسابقة ثابت لكل مرحلة دراسية لفترة زمنية يعاد تجديدها كل خمس سنوات، بحيث يكون الموضوع متجدد ويواكب المنهجيات العلمية المتطورة فكانت المحاور الثلاثة (منهجية STEM, Science,

Technology, Engineering and Math للمرحلة الثانوية، إعادة التدوير الإلكتروني للمرحلة المتوسطة، كتابة قصص من الخيال العلمي للمرحلة الابتدائية).

- إقامة الدورات التدريبية خاصة لكل مرحلة يتم فيها تدريب فريق من الطالبات ومعلماتهن على المستوى المحلي، حيث تم عمل تشخيص لواقع المعلمات وملاحظة بأن المعلمات غير ملمات ببعض الجوانب مما يترتب عليه آثار عدم القدرة على دعم الطالبة من خلال بناء المشروع.
- إثراء للمناهج الدراسية لكل مرحلة وتنمية لكل من شارك في المسابقة سواء المتأهل وغير المتأهل.

أولا مسابقة المرحلة الثانوية: STEM

هو نظام تعليمي يهتم بالعلوم والتكنولوجيا و الهندسة والرياضيات (Science, Technology, Engineering, Math). ويعتبر هذا النظام تعليمي و فعال بحيث يشمل مواد التعليم الأساسية الأربعة العلمية وهى العلوم والتقنية والهندسة والرياضيات. ويهدف الى قيادة التعليم نحوها ليهيئ الطالبة للواقع العملي والوظائف المستقبلية و يعمل أيضاً على خلق رؤية من خلال حل معضلة أو تطوير عمل معين يخدم المجتمع. يهدف نظام STEMإلى ربط الطالبة بالواقع من خلال حل مشكلة أو تصميم منتج يخدم احتياجات الواقع و سوق العمل و المجتمع.

ثانيا مسابقة المرحلة المتوسطة

النفايات الإلكترونية هي كل ما انتهت صلاحيته من (أجهزة الحاسب الآلي وكافة مستلزماته - أجهزة المحمول - الأجهزة الكهربائية مثل الميكرويف والثلاجة - أجهزة التلفزيون - أجهزة الاستقبال والإرسال، الكاميرات - ماكينات التصوير - معدات الطباعة - لمبات الفلوروسنت) و تحتوي النفايات الإلكترونية على مواد سامة تضر بالإنسان والبيئة. وعند التخلص من هذه الأجهزة بشكل عشوائي تتسرب مكوناتها من العناصر السامة إلى الموارد الطبيعية من ماء وهواء وتربة وتصل عبر السلسلة الغذائية أو بطريق الاستنشاق إلى الإنسان كما أن هناك أجهزة لا تتحلل و تضر بالبيئة. التدوير هو عمل من أعمال معالجة النفايات الخاصة بالانسان من أجل إنتاج سلع جديدة ، فبدلاً من التخلص من المواد غير المرغوب بها يمكن وبكل بساطة .إعادة تدويرها لتصنيع سلعة جديدة

ثالثا: مسابقة قصص من الخيال العلمي

تعتبر قصص الأطفال أحد ركائز المجتمع الحضاري فمن خلال القصة ينمو الطفل نفسياً ووجدانياً وفكرياً. وهي تساعد على تنمية روح القراءة والكتابة لدى التلميذات في المرحلة الابتدائية وتوسيع أفق الخيال. بحيث تعتبر قصص الخيال العلمي أحد أفرع القصص التي تتحدث عن العلوم والتكنولوجيا والمستقبل. يعتبر هذا النوع من القصص له ارتباط وثيق بمبادئ العلوم لأنهامبنية بجزء كبير على العلوم وجزء آخر بخيال الكاتب.

ومن خلال هذه المسابقة يتم الكشف عن مواهب الطالبات وإظهارها ورعايتها وتنميتها.كما يتم تعميق فلسفة المناهج الجديدة التي تكفل تغيير دور المتعلم ليخرج من حيز المتلقي إلي الناشط والمشارك في المواقف التعليمية .وبالتالي الارتقاء بمستويات الطالبات في القراءة والكتابة والخيال العلمي والتعبير بأسلوبهن الخاص وهذا ينعكس على تمكين الطالبات من لغتهم التي يساعد امتلاكها على تحسين إنجازهم الدراسي.

مراحل المسابقة	الوصف
عملية اختيار المدربين	تتم من خلال كتابة كراسة الشروط المرجعية للجهات الأكاديمية ذات الصيت حيث تعمل المبرة على انتقاء الأكفأ لتدريب الطالبات
نشر الوعي بين المدارس	يتم عمل برنامج توعوي بالتعاون مع قطاع التوجيه و قطاع الأنشطة المدرسية في المناطق المختلفة لمدارس الكويت على جميع المراحل التعلمية
التسجيل بالمسابقة	تتم من بعد ذلك عملية التسجيل بالمسابقة

التدريب	يتم تقديم برنامج تدريبي متكامل يشمل المعرفة العلمية و الجانب المهاري العملي و كذلك يشمل دورات في الإلقاء و الخطابة لتمكين جميع الطالبات من المعرفة اللازمة بحيث تعمل الطالبات و معلماتهن كفريق متكامل لتمثيل مدرستهن. كما يتم التركيز على تدريب المعلمات في البداية في كيفية التهيئة و رعاية الطالبات و بذلك تكتسب المعلمات معرفة بالإضافة إلى فن إدارة الأنشطة العلمية و رعاية الطالبات وتوفير الدعم
صياغة فكرة المشروع	يتم إعطاء مهلة ليضع كل فريق مشارك فكرته
فرز الأفكار	يتم فرز الأفكار بالاستعانه بجهة تحكيم محايدة و يتم قبول الأفكار العملية الصحيحة وفق معايير واضحة
العمل بالمشروع وتسليمه	تقوم كل مدرسة مشاركة بعمل المشروع و تسليميه بالموعد المحدد
التحكيم المحلي	يتم من خلال مناقشة الأفكار وعرض المشاريع
التأهل	يتأهل الفائز بالمركز الأول للمنافسة الخليجية
التحكيم الخليجي	يتم من خلال مناقشة الأفكار وعرض المشاريع
إعلان الفائزين	إعلان الفائزين

البحوث والمراجع التي تدعم استراتيجية التعليم التي ستثار أثناء الجلسة.

2 –الاستراتيجية:

الاستثمار في العنصر البشري النسائي لخلق جيل نسوي واع عن طريق التشجيع على البحث العلمي وصقل مهارات التفكير والإبداع في مجال المعرفة من خلال أنشطة علمية وثقافية متنوعة. و تنمية مهنية للمعلمات و الطالبات كرفيق واحد تتعلم الطالبة ومعلمتها، بحيث يكون المعلم و المتعلم في قالب واحد من التعلم التعاوني.

3 -وصف الجلسة:

خلال الجلسة عرض عملية انتقاء الأكفأ من الجهات التدريبية، وعرض مقتطفات من البرامج التدريبية للجهات المشاركة من كل من جمهورية لبنان الشقيقة ودولة الكويت والأدوات التدريبية المستخدمة على صعيد كل مرحلة دراسية وكل مسابقة. بحيث يتم التركيز على جانب التدريب كجزء أساسي من أجزاء المسابقة حيث لا تخرج أي مدرسة الاستفادة من برنامج تدريبي معتمد ذو جودة فتخرج المعلمة وطالبتها غير المتأهلة بحصيلة معلومات إثرائية في حين تتأهل الطالبات المتميزات للمنافسة والفوز.

البرامج التدريبية التي سيتم عرضها
برنامج تدريب STEM
برنامج تدريب التدوير الإلكتروني
برنامج تدريب فن كتابة القصة القصيرة
برنامج تدريب فن الإلقاء

4 -الختام:

إن عرض هذه المسابقة يسهم في تطوير أساليب التنمية المهنية للمعلمين و التعاون المثمر عبر قطاع الأنشطة المدرسية و تعزيز دوره و من هنا تتحقق عملية المشاركة المجتمعية بشكل هادف و صحيح يضمن الارتقاء في الميدان التربوي عبر أنشطة متسلسلة و هادفة و كذلك عبر الاستعانة بالأكاديميين الأكفاء لنقل المعرفة للأجيال.

5 -المراجع: http://ibtikar.com.kw

The Effect of Science Education Teaching Faculty's Collaborative Documentary Work on their Professional Development in Lebanese Universities

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This study aims at describing the style of collaboration among science education teaching faculty members, the types of resources they use and their work environment. It has been conducted using a descriptive qualitative approach utilizing a questionnaire filled by thirty-eight out of forty-four full timers at the eight Lebanese universities with the highest percentage of students (60%). This study also aims at examining the effect of collaborative documentary work on five selected teaching faculty's professional development. This has been done using a qualitative multiple case study utilizing our elaborated model, the "Synthesized Model", fused from two approaches (Documentational Approach and Interconnected Model of Teachers' Professional Development) to analyze teachers' observations, interviews and logbooks. The selected teachers performed their documentary work to prepare "Teaching strategies" and "Assessment methods" in science using the Team-Based Learning (TBL) approach that they have been coached to adopt during a workshop by the researcher. Qualitative results show tailored levels of growth for each teaching faculty, and the team that has experienced a superior extent of reflection during collaboration and documentary work exhibits more pronounced professional development. These results imply the efficiency to advocate more opportunities for non-formal professional development embedded in collaboration and reflection of the daily activities.

Introduction

Due to Information and Communication Technology (ICT) integration in the education sector, resources have become copious, so educators have to engage in a colossal task of collecting and filtering resources from different sources, transforming them into documents, and finally implementing the resulting document to students and evaluating it. This is termed 'documentary work' which could increase teachers' knowledge and hence, their professional development (Trouche and Pepin, 2014). During documentary work, educators are involved in an on-going reflective engagement which is time consuming, but it could be facilitated by collaboration. Although collaboration among like-minded peers has become a sign of quality in education, it is rarely applied in the Higher Education Sector in Lebanon (Towards Lebanese Quality Assurance, 2013). On the other hand, research proves that teachers' professional development is the most crucial to students' achievement level and participation rate (Robinson, 2008). Consequently, a lot of research conducted in this last decade has focused on teachers' professional development at the school level, yet less is available on teaching faculty in the Higher Education Sector in Lebanon (Hojeij, 2012).

Consequently, a two-year study was performed to study the effect of teaching faculty's collaborative documentary work on their professional development at the Lebanese universities. The teaching faculty members in the science education departments were chosen as sample. In

this study, two theoretical approaches were fused: The Documentational Approach (Trouche and Pepin, 2014) and the Interconnected Model of Teachers' Professional Development (Clarke and Hollingsworth, 2002). The result of this fusion was our "Synthesized Model" that was used in the analysis of the qualitative results. On the other hand, the quantitative results will not be presented in this report.

Method

Design

The study follows a sequential mixed-method approach and is composed of two parts: The quantitative study (the first part) consists of a description of the state of Science education teaching faculty in the Lebanese Universities, while the qualitative study (the second part) is a multiple-case study.

Participants

According to the Directorate General of Higher Education (DGHE) statistics in 2014, Lebanon had 42 universities: 4 of them do not contain education departments, so they were directly excluded from the study; 27 others comprise just 11% of the total number of students, so they were excluded for feasibility purposes. Eventually, the remaining 11 universities were contacted and 8 agreed to participate in the first part of the study (the quantitative part) these comprised 60% of the students in the Lebanese Higher Education sector. 38 out of 44 of its full time teaching faculty in the science education departments completed the questionnaire. On the other hand, the sample who participated in the second part of the study (the qualitative part) consisted of 5 teaching faculty members. The 5 teaching faculty members assigned themselves to two teams to prepare four TBL sessions covering the topics of "Teaching strategies" and Assessment Methods" in science.

Instruments

A questionnaire was designed for the first part; while field note observations, semi-structured interviews and logbook analysis were implemented for the second part.

Procedure

The period of the study was from January 2015 till August 2016. It included:

- Meeting with the chairpersons/deans of the education departments in 11 universities
- Fulfilling the IRB requirements
- Distributing the questionnaires to the full time teaching faculty members of science teaching in 11 universities
- Collecting the questionnaires from 8 universities (38 teaching faculty out of 44 filled the questionnaire)
- Performing the descriptive quantitative analysis
- Collaborative documentary work of the five teaching faculty
- Filling the Logbooks
- Observation of the TBL sessions
- Execution of the interviews
- Performing the qualitative analysis

Data Analysis

Data from the questionnaire was analyzed descriptively using the Statistical Package for Social Sciences (SPSS) version 19; while data analysis of the observations, interviews and logbooks followed the established qualitative approach by Miles and Huberman (as quoted in Petty, Thomson, and Stew 2012). The 'template approach' (DiCicci-Bloom and Crabtree, 2006) was used for coding. This approach consists in designing a 'codebook' from prior research and theoretical background. Consequently, the 'Professional Development Analysis Grid' or 'Codebook', was constructed in order to make meaning of the data collected.

Results of the qualitative part

Even though each team differs in the extent of collaboration it has practiced during documentary work, data collected for each teaching faculty shows individualized and tailored developments: "changes" in the personal, performance, external and consequence domains, "growth sequences", and "growth networks" (or professional development), resulting from several enactive and reflective links. These are more pronounced in the team that has practiced more collaboration in documentary work and in teaching as witnessed by their students and by other faculty members in their institution. This demonstrates the complexity and idiosyncratic nature of teaching faculty's professional development.

Discussion and Implications for Practice

Results of the study imply that if enough support, enforcement and incentives are given to the teaching faculty from the university administration and/or from the education policy makers in Lebanon, the teaching faculty might be enthusiastic to work collaboratively because they are already conscious of its significance. Teaching faculty, are ready to share their educational resources specifically with the teaching faculty of the same department. This collaboration could be fortified because the MEHE is in favor of this working style to improve quality at the Higher Education sector. So, we suggest that if the educational policy makers in Lebanon could provide opportunities for non-formal, on-the-job professional development that include collaboration and reflection, and encourage teaching faculty members to take part in them, some of the challenges of the Higher Education sector could be met.

Materials needed: LCD projector, overhead screen, white board and pen

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Developmental Workshops

Resources for the STEM classroom

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Rote or passive learning, lower- order thinking, inert knowledge, test pollution, grades inflation… are all routines or practices we suspect are taking place in our educational system. In addition, the performance of our students (MENA region) on international exams such as TIMSS and PISA is below average and it is getting worse with time! One of the promising approaches to overcome the above stated obstacles is through STEM education. STEM is about using Science, Technology, Engineering and Mathematics to solve real – world problems or to explain natural phenomena in scientific manner. This applied, problem/project-based approach to learning allows students to understand and appreciate the relevance of learning to their own lives and the surrounding environment. However, one of the main challenges facing the sustainable implementation of STEM education is the lack of pedagogically-sound classroom resources. In this workshop, a rich set of STEM resources will be examined in the context of classroom instruction.

Introduction

A lot of studies state that meaningful learning is a byproduct of a constructivist teaching approach (Jonassen, 2007). It is assumed that meaningful learning is correlated with an increase in student achievement. One of the promising approaches to achieve meaningful learning is through STEM (Science, Technology, Engineering and Mathematics) education.

Strategy

STEM education is a transdisciplinary approach to learning that removes the traditional barriers separating the four disciplines of science, technology, engineering, and mathematics and integrates them into real-world, and relevant learning experiences for students.

STEM is about using Science, Technology, Engineering and Mathematics to solve real – world problems or to explain natural phenomena in scientific manner. This applied, problem/project-based approach to learning allows students to understand and appreciate the relevance of learning to their own lives and the surrounding environment. In addition, the 4Cs (Critical Thinking, Creative Thinking, Communication, and Collaboration) are implicitly embedded in well-developed STEM activities.

Description of session:

The workshop session is planned as follows: (a) Brief introduction about STEM education; (b) The STEM Approach; (c) How a STEM approach promotes higher-order thinking skills; (d) A

demonstration of a sample of STEM activities; (e) The STEM learning lab; (f) List of STEM resources.

Participants will have the opportunity to engage in the lecture-discussion model of the workshop. In fact, they will actively engage in some activities regarding the various aspects o STEM education.

Conclusion

If we want our students to succeed in life, let us teach them how to think critically and solve problems. The best way to do that is to provide them with a good foundation in science, technology, engineering, and mathematics (STEM).

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Preparing multimedia-enriched computerized assessment and generating IEP or remedial intervention reports based on their results

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Formative assessment, a valuable tool in teaching, requires teachers to obtain and analyze information on student learning in a short space of time; this is why formative assessment, despite its benefits, is not widely used in the classroom. The aim of this workshop is to introduce an efficient workflow that would allow teachers/coordinators to make the most of their time and to be able to prepare multimedia-enriched formative assessment, whenever need be, and to generate, programmatically, remedial reports without wasting time on grading tons of papers nor manually preparing reports listing each student's strengths and weaknesses. The skills and techniques trained for in this workshop empower teachers and facilitate the tedious task of correcting, grading, and data analysis thus saving the teacher's valuable time and effort. The tools used for the said purpose are all user-friendly and readily available for download either as freeware or as demo versions. Sample files will be freely distributed as well as any server-side scripting files whose aim is to bridge and "glue" the used tools.

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).

Formative assessment requires teachers to obtain and analyze information on student learning in a short space of time (Ruiz-Primo, 2011); this is why formative assessment, despite its benefits, is not widely used in the classroom (Shute & Kim, 2014).

The aim of this workshop is to introduce an efficient workflow that would allow teachers/coordinators to make the most of their time and to be able to prepare multimedia-enriched formative assessment, whenever need be, without wasting time on grading tons of papers nor manually preparing reports listing each students strengths and weaknesses for the correction and report generation will be automated.

Strategy: The importance of formative assessment and multimedia-enriched, interactive quizzes is first highlighted followed by hands-on training on building such type of assessment as well as collecting the detailed grades of the students, analyzing them, and building sophisticated reports based on their results.

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

- Brainstorming the available quiz-making tools that the teachers may be aware of or have previous experience working with.

- Elaborating on the previous brainstorming activity listing the said tools: the facilitator will point out that most of the modern tools work online and allow the teacher to build the quiz via a web browser after registering an account or paying a certain fee before the teacher can share the quiz with his/her students.

- 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 aforementioned issues explain why an offline quiz-making tool is a better choice for this particular type of quizzes (multimedia-enriched) and in this particular context (slow and unreliable internet connection)

- The tool of choice should allow distributing the quizzes over a local area network without the need of an internet connection. What this means is that the multimedia-enriched quizzes, generated by the software (iSpring QuizMaker), can be distributed i.e. delivered to the students' laptops/tablets without the students having to connect to the internet. The delivery process (distribution of quizzes) can be done locally over the local area network since the quiz will not be hosted on a website but rather on a local pc connected to the local area network. The said local area network can be an ad-hoc network with no internet access, a simple network connecting the instructor's pc to the students' pcs/tablets.

- Finally, the said tool should also allow automatic correction and grading of quizzes as well as collection of the detailed grades **on a per question basis** as to ensure that the individual learning objectives/skills were evaluated and not the overall achievement of the student. (maximum of 15 minutes)

- Introduce iSpring QuizMaker software, the type of questions it supports, and the options the teacher has to track the students' detailed performance (via email or submission to a server) (15 minutes)

- Allow teachers to run the software and build a simple quiz of their choice. (20 minutes)

- Explain the basics of configuring quiz maker to send results to a local server (specifying the server's url) and demoing a local portable server receiving and parsing the results in real time. The server will run off a USB flash disk and will not require installation or complex settings.

- Allow teachers to download copies of the results as excel sheets. (5 minutes)

- Train the teachers to use the "=IF" excel function and to branch scenarios based on the student's answer to each question. (15 minutes)

- Explain the usage of Microsoft Word's mail merge feature in preparing an individual report for each student. (20 minutes)

- Teacher will try building a simple remedial intervention report on their own using the excel sheet they've previously downloaded. (30 minutes)

Conclusion : The suggested workflow is efficient, economic, and time saving. It can be further enhanced and streamlined by adopting an LMS that's specifically designed to account for the teachers' needs and which seamlessly integrates with the generated quizzes (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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Using textbooks as a main resource for teaching, how can teachers exploit the power of visualization in geometry?

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Mathematics relies heavily on visualization that requires seeing the unseen. Visualization is defined as the ability to create, interpret, use, and reflect on visual representations in order to develop, depict, and communicate new information and advance understanding. More than any other division of mathematics, teaching geometry faces lots of challenges related to visualization. This might be due to the complexity of geometric figures and the ambiguous relation between visual representations and geometrical objects. Knowing the influential role on teachers and learners that textbooks are still playing in classroom teaching, a deep analysis of how textbooks facilitate or hinder visualization is necessary. Moreover, it is necessary to have awareness of this issue by educators and teachers to allow them to judge what is in the textbooks and to study the possibility of altering or creating learning activities that can better enhance visualization. Participants in this workshop will be performing hands on activities and will be involved in interactive discussions. They will be analyzing geometry problems taken from the mostly common used textbooks, and giving their own recommendations. Moreover, participants will be reflecting on their own experiences and will have a chance to create activities that will enhance visualization.

Introduction

Mathematics deals with objects and entities different than physical phenomena, and it relies heavily on visualization that requires seeing the unseen. Visualization is defined as the ability to create, interpret, use, and reflect on visual representations in order to develop, depict, and communicate new information and advance understanding. Visualization does not stop at the perceptual level, but it involves conceptual meanings, moreover, it is not limited to illustrative purposes, but it is a major component of reasoning, problem solving, and even proving. (Arcavi, 2003)

Regarding visualization, geometry has challenges more than any other field of mathematics. Geometry deals with mental entities called geometric figures that possesses both conceptual and figural characters (Fischbein, 1993). Duval in many of his papers elaborated the complexity in learning geometry, and the role of visual representations. He noted students' inability to distinguish among the geometrical object and its representations, such as visual representations (diagrams or drawings). Duval believed that students associate to the object some characteristics that are related to the sensible space of the drawing and not to the object itself. The complexity in the use of figures stems from the fact that the geometric figure is rooted in the functioning of two representational registers, the visual and the discursive (language), and they are cognitively heterogeneous and operate in a parallel way. The articulation and coordination among these

registers is a necessary condition for geometric reasoning (Duval, 2005). Handling multiple representations presents a cognitive difficulty, but it is at the core of mathematics learning. Moreover, it is necessary to attain a flexible and competent translation back and forth between visual and analytic representations (Arcavi, 2003).

Although in the recent years there was an increase interest in the value of geometry given in school curricula, but there are only few situations that exploit the power of visualization. Educators and Teachers must be aware that teaching more geometry, using more visual representations, or asking students to do more constructions might not guarantee or facilitate visualization (David and Tomaz, 2012). In addition, visual representations are not given full value in mathematics practice, since many researchers believe that it is not safe to rely on visual reasoning. Here also it is important to clarify that visualization does not mean complete dependence on visual representations, rather than the coordination among different representations. Teachers' education does not always provide teachers with sufficient preparation to face the challenges in teaching geometry. As teachers, we need to have a better understanding of these challenges, and be aware of the didactical complexities that we face while teaching geometry, especially in middle school. This level is considered as a transition since the teaching of geometry undergoes a change in the paradigm that can cause didactical difficulties and misinterpretations between teacher's expectations and students' work (Kuzniak, 2010).

We must be aware of the influential role that textbooks are still playing in teaching. Fujita, Jones & Kunimune (2009) believed that the textbook, as an important artifact, influences both teachers and learners. This is due to the facts that the design of the curriculum in mathematics impact what students learn, and that students experience this curriculum through textbooks. For them textbooks constitute an important component of the potentially implemented curriculum, which is in between the intended and implemented curriculum. Knowing that the textbooks are the main teaching resource in our classrooms, it is important to put them under a magnifying lens to check whether they are facilitating visualization and helping students overcome their difficulties, and to help teachers in supplementing the needed experiences and developing missing skills for students. A review of the mathematics textbooks for middle school shows that geometry is usually presented as formal subject, the introduction of rigor and deduction is not smooth, the issue of visualization is not given enough attention, and there is a gap in the curriculum during the transition period. This necessitates the awareness of educators and teachers to take needed measures.

Strategy

Participant in this workshop will be taking part in hands-on activities, as well as, interactive discussions. They will be required to reflect on their own teaching experiences in the geometry classrooms. Moreover, teachers will be analyzing and comparing geometry exercises from different textbooks. They will be also working in groups to suggest activities that has the

potential of enhancing visualization. The aim of this session will be to give participants the chance to:

- Identify the basic role that visualization can play in geometric reasoning.
- Recognize the difficulties related to visualization that students face while solving geometry exercises
- Relate these difficulties to basic theories.
- Participate in activities and discussions with teachers having similar or variable teaching experiences.
- Cooperate with paper sharing the same profession to come up with recommendation that can help teachers in their classrooms.

Description

(a) Present a brief introduction to highlight on the importance of visualization in geometry (10 min), (b) Participant will take role in a group discussion to identify common believes and classroom practices related to visualization and the utilization of geometry textbooks (20 min), (c) present basic definition and related learning theories (15 min), (d) Participant will be required to individually analyze different exercises from different textbooks and relate their analysis to what has been presented previously (15 min), (e) collect result and look for common trends (10 min), (f) work in groups to suggest activities that can enhance visualization (20 min), (g) Reflect on the given activities and suggest other situation that can be beneficial in this case (15 min), and (h) Sum up, give recommendations, and allow for questions (15 min).

Conclusion

It is said that teachers teach what is in the textbooks. To an extent this is true, but are teachers bounded only to what is exactly found in textbooks? Teachers must have the chance to analyze their students' difficulties and needs in order to fill in the gaps and modify and supplement their teaching with activities that can enhance learning. This becomes a must when working with a subject like geometry in which teaching it is full of challenges. Follows are some recommendations for teachers:

- Understand the important role that the geometric figure can play in geometric reasoning; as a heuristic tool that help students while solving geometric problems, as a representation that clarifies relations among objects, as an aid that allows students to see connections and examine details, and as a help for conjecturing and reasoning.
- Provide students with more instructional activities to develop their competencies in working with geometric figures.
- Clarify the norms and the rules for the use of drawings of geometric figures explicitly and intentionally, and consider it as an object of teaching in the mathematics activity, but not in a traditional way. (David & Tomaz, 2012)

- Use multimodal approach instead of unimodal to access mathematical objects and learning, and to make use of different modes of activities and experiences. (Figueiras & Arcavi, 2014).
- Help students to articulate different representations by moving in both ways between the source and the target. The teachers can generate a variety of useful questions by presenting an idea in one representational mode and asking the student to illustrate, describe, or represent the same idea in another mode. (Gagtasis & Shiakalli, 2004)
- Provide instructional situations that can facilitate different interaction with diagrams and support reasoned conjectures. (Herbst, 2004)
- Make explicit the basic knowledge related to geometric figures given by Gobert (2007) that will facilitate articulation among different representations

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Assessments through real life simulation

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If I taught someone to play golf I would not check what they have learned with just a written test. I would want to see more direct, authentic evidence. Today's students need to know not only the basic reading and arithmetic skills, but also skills that will allow them to face a world which is continually changing. They must be able to think critically, to analyze, and to make inferences. Changes in the basic skills and knowledge, which our students need, require new learning goals; these new learning goals change the relationship between assessment and instruction. Teachers need to take an active role in making decisions about the purpose of assessment and the content that is being assessed. If they want their students to be able to use the acquired knowledge and skills in the real world, then their assessments have to tell that their students can apply what they have learned in authentic situations. As a matter of fact, teachers may already be using authentic tasks in their classrooms or they may already have the standards written, perhaps they need to more clearly articulate a framework to develop a performance task. A performance task is a form of an authentic assessment in which students demonstrate meaningful application of essential knowledge and skills in real world situations.

The aim of this session is to provide teachers with the opportunity to enhance their professional development concerning the assessment tools that they might use in their schools. Educators will figure out that traditional assessments can't work anymore to assess 21st century learners. In the "traditional assessments" model, teaching and learning are often separated from assessment i.e. a test is administrated after knowledge and skills have been acquired. Unfortunately, most of our schools are ultimately more interested in how much information students can acquire than how well they can use it. Thus, our most meaningful assessments ask students to perform authentic assessments which encourage the integration of teaching, learning and assessing. Moreover, in the "authentic assessment" model, the same authentic task used to measure the students' ability to apply the knowledge or skills is used as a vehicle for student learning. Throughout this workshop, participants will realize that a task is considered authentic when students are asked to construct their own responses rather than select the one presented and when the task replicates challenges faced in the real world. If assessment is authentic, ongoing and integrated with classroom instruction, then it is easy to see that it will take many different forms. One distinguished form is the "Performance Task" which is any learning activity or assessment that asks learners to perform in order to demonstrate their knowledge, understanding and proficiency. Unlike a selected – response item (e.g. multiple choice or matching) that asks students to select from given alternatives, a performance task presents a situation that calls for learners to apply their learning in context.

"You never want to get on a plane where the pilot learned to fly from worksheets" (by todd whitaker) is a quote that will inspire participants to expect the central idea of this session. Then, they will produce ideas and share knowledge and experiences to define the term "assessment"

through applying the quadrant strategy. After that, they will brainstorm the reasons behind assessing learners. Moreover, various kinds of assessments will be displayed for participants to sort out each into traditional versus modern tools. "How do you monitor your students' understanding in your math classroom?" will be the heart of our session because it's an essential question to be answered by participants who will support their responses by examples. Later on, participants will be introduced to a remarkable assessment tool "Performance Task" that evaluates students' ability to apply what they have learned in mathematics to a "real world" context. Also, they will get the chance to be in their students' shoes through living a real-life situation that could be applied in their math classrooms. Through discussing the task, participants will realize that when presented with real-world problem to solve, students are learning in the process of developing a solution, teachers are facilitating the process and therefore students' solutions to the problem become an assessment of how well they can meaningfully apply the taught concepts. Moreover, the applied task will guide participants to discover the components of the framework for the performance task outlined in the acronym "GRASPS". At the end of this session, participants will cooperatively design a fleshed out performance task relevant to their classrooms.

The flow of the session will be as follows:

(a) Icebreaker Activity (5 min.)
(b) Participants will be given an inspirational quote and then they will post their expectations on a flipchart (5 min.)
(c) Participants will apply the quadrant strategy to define the term "assessment" (10 min)
(d) Participants will brainstorm ideas about the reasons for using assessments (5 min.)
(e) Participants will sort out assessment tools as traditional and modern using a T-chart (10 min.)
(f) Participants will apply a math performance task about using percentage in real life situations. (20 min.)
(g) Participants will discover the framework of performance task "GRASPS" (10 min.)
(h) Presenters will share with participants their experiences at their school. (15 min.)
(i) Participants will cooperatively design a performance task relevant to their classrooms (20 min.)
(j) Participants will present their work (15 min.)
(k) Participants will be given handouts after filling the reflection sheets about the workshop (5 min.)

Assessment is the process of gathering and discussing information from multiple and diverse sources in order to develop a deep understanding of what students know, understand, and can do with their knowledge as a result of their educational experiences. Thus, it's an integral part of instruction, as it determines whether or not the goals of education are being met; it's the process of making a judgment or forming an opinion. Assessments can take different forms, some of

them are considered to be traditional that don't often accurately reflect the individual student's understanding of the concept; it reflects whether a student is successful at memorization. However, rather than rote learning and passive test-taking, authentic assessment focus on students' analytical skills and the ability to integrate what they have learned and explain when it would be appropriate to use those facts and problem-solving skills in their own lives. Today's learners can't simply be fed the knowledge, yet they need to construct their own meaning of the world using information they have gathered, taught and gained from their own experiences. As educators, if we want to know if our students can apply knowledge and skills they have learned, then authentic assessments will provide the most direct evidence. The most noticeable authentic one is called "Performance Task" which is a complex scenario that provides students an opportunity to demonstrate what they know and are able to do concerning a given big idea. To design such a task easily, GRASPS, a framework for any performance task, is an effective guide for teachers where they can determine the goal of the task, the role of the learner, the audience, the situation they want to put their learner in, the product and the standards needed for evaluating their learners.

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To Infinity & Beyond…Robotics

Raefa Jomaa and Farah Kobrosli, Al-Makassed Dawha School, Saida-Lebanon

To invent, to innovate, to create! These are all key aspects of K-12 engineering, yet true open-ended creativity is a challenge for many teachers. With the Robotic kit and computer programming as a central tools, this workshop is designed to build future leaders by providing them basic knowledge and creating interest in Robotics Field. We will be working on designing and developing experiential learning tools to develop and promote the spirit of science and technology to learners, enabling them to have hands on feel of technology and its applications. Robotics workshop promotes the use of technology, electrical circuits and programming to develop a sense of creativity and design thinking in kids. We are going to help teachers develop the skills and ability necessary to teach innovative engineering and programming inside or outside the classroom. Through hands-on activities, this workshop aims to improve teacher's ability to teach creative engineering design with the use of Robotic Kit and computer programming.

To begin this workshop, participants will be introduced to the Robotics invention kits and how the kits can be used as tools to innovate and engineer. After this brief introduction, participants will use the kits in small groups to complete the hands-on activity to explore how electricity flows and then manipulate electrical current to create unique, interactive musical instruments with fruit, metal, water, pencil lead or other conductive materials. This activity aims to introduce teachers to the components of the Robotic kit, how to set it up, and how it interacts with the computer. To conclude this introductory activity, participants will learn about the various activities and projects that teachers have done with the kits.

I will supply the participants with a CD that contains the Scratch software. Duration the session, they will download the software on their laptops.

After this introductory activity, teachers will be introduced to Scratch programming. During this activity, participants will learn about and complete some basic programming tasks. Through this interactive learning experience, participants will develop a basic understanding of Scratch and how it can be infused into the engineering design process.

Once teachers have a basic understanding of both the Robotic kits and Scratch programming, participants will move into a mini "Challenge." In this activity, small teams of participants will apply their knowledge to begin designing and creating interactive video games that incorporate the Robotic kits, conductive materials, and Scratch programming.

At the conclusion of the workshop, we will see the different projects designed by the educators and discuss with them how will these challenges involved in promoting creativity and the integration of technology, programming and engineering design at the elementary school level. Participants will take away hard copies and soft copies for some activities and be provided with links online for other digital resources.

Innovation in STEM Education

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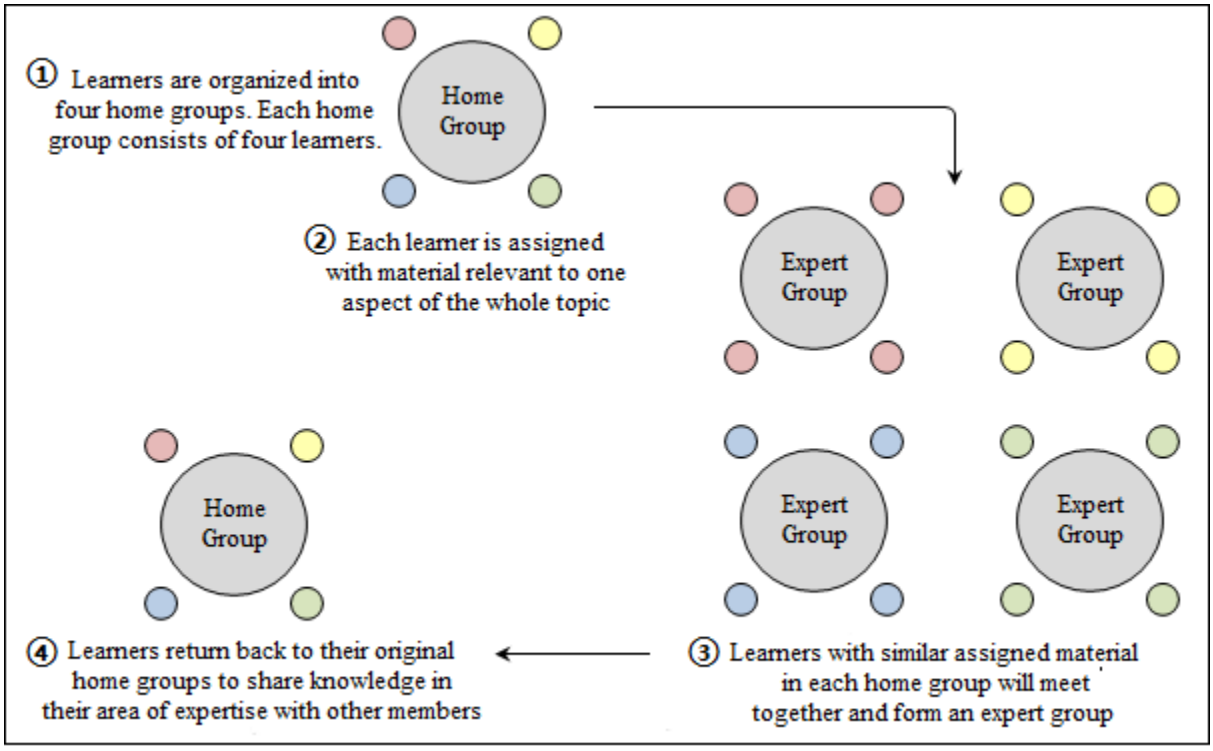
Technological advancement is behind the quick outdating of technical knowledge in various fields of study, and this is reflected in the disappearance and emergence of many occupations. Therefore, we cannot educate the workforce of the future for specific occupations today, because we cannot guarantee the existence of these jobs in the future. However, we can prepare a creative and innovative workforce that is ready for the 21st century job market. One approach that can foster innovation in the current generation of learners is STEM education. This approach calls for integrating the content and skills of Science, Technology, Engineering, and Mathematics into a unified cross-disciplinary subject to create a learner-centered environment that motivates learners to investigate and engineer solutions to problems, and construct evidence-based explanations of real-world phenomena. Innovation is not only an ends to STEM education, but also a means to its effectiveness. Consequently, this workshop introduces two strategies of active instruction that enable teachers to be innovative with available resources to achieve effective STEM learning.

Introduction

Rapidly changing technologies are behind the disappearance and emergence of many occupations. Twenty years ago, no one would have predicted the recent demand for 3D printing technicians, social media managers, and digital marketing specialists. Technological progress is also responsible for the quick outdating of technical knowledge in many fields, such as biotechnology and information technology. Hence, we cannot educate the workforce of the future for specific occupations today, because simply we cannot guarantee the existence of these jobs in the future. However, we can prepare a creative and innovative workforce that is ready to stand up to the job market of tomorrow, and solve problems that don't exist yet. In fact, one approach that can foster innovation in the current generation of learners is STEM education. STEM is an acronym for Science, Technology, Engineering, and Mathematics. This educational concept calls for integrating the content and skills of the aforementioned disciplines into a unified cross-disciplinary subject to create a learner-centered learning environment in which learners investigate and engineer solutions to problems, and construct evidence-based explanations of real-world phenomena. As mentioned earlier, innovation is one of the main objectives of STEM education, but it can also be conceived as an essential attribute of educators and learners engaging in this approach. 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. To my knowledge, very few schools in our region are engaged with STEM education, so the strategies of instruction addressed in this session can be of great significance to conceptualize innovation in STEM education, and rectify all the misconceptions surrounding that approach.

Strategies of Instruction

Integrating the disciplines of Science and Mathematics is not a new practice in the realm of education; however, the emergence of STEM education revolutionized the ways of integration. Before engaging in STEM teaching, educators need to acquire a baseline of skills that enable them to be creative and innovative in presenting the integrated subject matter. One model that provides educators with this baseline is the TPACK framework. TPACK is an acronym for Technology, Pedagogy, and Content Knowledge. This framework emphasizes the complex interplay of three primary forms of knowledge: Content (CK), Pedagogy (PK), and Technology (TK). A successful STEM educator makes creative links between what is being learned (content), how it is taught (pedagogy), and the appropriate tools (technology). The TPACK model will be disclosed in the second segment of the session. Two pedagogical strategies relevant to STEM education are cooperative learning and problem-based learning (PBL). Both strategies are learner-centered, but necessitate a knowledgeable, innovative and organized teacher. Cooperative learning consists of having learners work together to achieve a joint learning goal. This strategy ensures that learners are involved in understanding what they are learning. Cooperative learning also provides time for teachers to reorganize notes and move around the class listening to what learners are saying. Listening to discussions can give teachers direction and insight into how well learners understand the concepts and material being taught. One technique of cooperative learning is the jigsaw method. In a jigsaw activity, learners are organized into different home groups. Each learner in the home group is assigned with material relevant to one aspect of the topic under study. Then, each learner will meet with members from other home groups who are assigned with similar material, forming expert groups. Members of each expert group will extensively discuss the assigned concepts, utilizing tools of technology for further in-depth research. Finally, learners return back to their original home groups to share knowledge in their area of expertise with other members. Usually, all concepts are later reinforced by the teacher to ensure that all learners acquired them.



Jigsaw: A Cooperative Learning Technique

Furthermore, problem-based learning encourages learners to work in teams in order to solve authentic ill-structured problems before being formally introduced to concepts. Learners are usually given a problem or a scenario. Problem-based learning requires teacher guidance and team collaboration. It also urges learners to use high-level thinking skills, which require them to analyze, evaluate, and create. Problem-based learning can increase learner interest in Science, Technology, Engineering, and Mathematics (STEM) because it encourages learners to solve authentic problems, work with others, and build real solutions (artifacts). The strategies of cooperative learning and problem-based leaning will be disclosed subsequently in the third and fourth segments of the session through active hands-on activities.

Description of Session

This workshop is designed to promote innovative strategies of STEM instruction that can be easily implemented by teachers in the classroom. The session will be divided into four main parts. The first part is mainly based on guided discussions, while the remaining parts are mainly designed to engage participants in hands-on activities.

- The first part of the session will serve as an introduction to STEM education. The session will commence with a short video that sheds light on the rising popularity of 3D printers and on the recent demand of 3D printing technicians. A guided discussion will follow the video, stressing on the role of technological advancement in the emergence and disappearance of many occupations. The essence of the discussion will revolve around the notion of a fundamental reform in the educational system to prepare a creative and innovative workforce that can tolerate the challenges of the future. Subsequently, the concept of STEM education will be introduced to the attending teachers/coordinators. Common misconceptions of STEM education will be addressed, in an attempt to rectify them. Further discussion on the effectiveness of integrating STEM disciplines will take place, and participants will be encouraged to share their experiences. The allotted duration for this part of the session is 20 minutes.

- In the second part of the session, participants will be asked to work in pairs to come up with a unit of study that integrates concepts of Science and Mathematics. The unit of study can be aimed towards elementary level or intermediate level. It is also preferable that each group consists of a Science teacher and a Mathematics teacher that teach the same grade level. After that, the TPACK framework is introduced through a short video. A quick discussion is followed, and then participants (same pairs) are asked to work within the TPACK framework to create a lesson plan (from the suggested unit of study) that incorporates content knowledge, pedagogical knowledge, and technological knowledge. For example, if the chosen unit of study is Matter, participants can focus on the measurable physical properties of matter (mass, volume, and density), and then construct their plan according to the TPACK framework. The allotted duration for this part of the session is 30 minutes.

- The strategy of cooperative learning will be introduced in the third part of the session. Participants will engage in a jigsaw activity revolving around a real-life problem. Each expert group will study and discuss the addressed problem from a different STEM discipline, and then home groups are required to communicate and share their findings to come up with a practical solution for the problem. The allotted duration for this part of the session is 35 minutes.

- The strategy of problem-base learning will be introduced in the last part of the session. Participants will engage in Forensic Science as a STEM problem-based learning device. A case scenario about a robbery will be presented, and participants need to employ concepts and skills of STEM to solve the case. The allotted duration for this part of the session is 35 minutes.

Note: No prior knowledge of STEM education is required to participate in this workshop. Participants will also receive at the end of the session a handout that includes all the tackled strategies, in addition to the references used.

Conclusion

The rapid technological advancement requires our educational system to adopt new methods of learning that can promote creativity and innovation in today's learners to be the leaders of tomorrow, and stand up to challenges that are yet to exist. One approach is STEM education, which calls for integrating the content and skills of Science, Technology, Engineering, and Mathematics into a unified cross-disciplinary subject. However, teachers engaging or who plan to engage in STEM education need to be highly knowledgeable in the subject matter and its crosscutting concepts, and also needs to be innovative in preparing and delivering instruction. Teachers can work within the TPACK framework to achieve a holistic learning experience. Two methods of instruction that can aid teachers are cooperative learning and problem-based learning. Both methods promote collaboration and teamwork among learners. Lastly, continuous teacher training is recommended to achieve the ultimate goal of STEM education.

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Video Links

https://www.youtube.com/watch?v=ywMIdRh5Y18

https://www.youtube.com/watch?v=yMQiHJsePOM

Learning how to learn

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Do you ever struggle with students forgetting what they learned just after the test? Do you often wonder why students are not able to make links between subjects? Why do they blindly jump into answering a question without even understanding it? Do they understand the material or do they just solve without understanding? Why they are not able to apply what they learned in one subject in another, such like applying Math in Physics? And why do they study on the last minute?
In this workshop we will answer those questions and many more. We will learn what goes inside students brains, how does it work, how does it integrate information, and how do information pass from short term memory to the long term one and where does the system fail in doing that. Where does the exam system fail in building strong analysis abilities within students and how to overcome that? We'll learn "how to learn", how to deal with procrastination, we'll cover techniques that enhance our ability for learning, we'll discover the best ways for note's taking, and show how it is linked to learning, we'll explain why is self-testing beneficial for students and why do they need to understand the importance of making mistakes. We'll explore illusions of learning, the drawbacks of overlearning, and how to build links between subjects, in particular Math and Physics. We'll do that through discussions, solving riddles, playing games and more.

One of the main struggles of educators, regardless of the subject they teach, is that exhaustion feeling, the feeling that what they worked hard for, the effort they did to transmit an information, is pointless just as if it disappeared or never existed…
This workshop is all about that, about why what is supposedly "acquired information" is being lost; it is about learning, in particular "learning how to learn".
It is based on a struggle that all teachers face: why students forget the information that is supposed to be learned, just after a test or when the corresponding chapter ends. Why they are not able to make links between subjects and, in particular, why students are not able to apply the maths they learn in other subjects, such as physics-from my experience, although they succeeded in the math tests!
Are we teaching them how to study for a test or how to learn?
Which leads us to the beginning: what is the purpose of learning? I asked my students to come up with 5 reasons for learning, some of them couldn't even come up with one apart from "having good grades".
As educators we have to ask ourselves: what is the knowledge that we want to transmit to students on the long term? What should be the essence of the 15 years of education in school? We should as well be able to answer the famous question asked by students from all ages: what is school for? How and where we are going to use math rules and Physics laws in real life? Why should I care to find X that is meaningless to me? And that's where the problem lies: the lack of meaning; when the knowledge is meaningful, then there is a purpose for learning.
More than being taught how to answer a question, students should learn how to understand the question, analyse the problem, and finally learn how to address it using the right rules and laws.

Students should learn how to ask questions not only answer them. This will help them to make better analysis, instead of simply memorizing.

This year's SMEC theme focuses on what teachers use in their work to enhance their ways of teaching. Thus in this workshop we will learn about memory, how brain uses two different learning modes, how it integrates information and how the neurons get linked to create "chunks" of information (chunks are compact packages of information created to be easily accessed by our mind). We'll talk about how we can form chunks, how small chunks link to make bigger ones, and why it's essential for long term memory. How to use those chunks to improve understanding a subject, and how chunks can help students to do better on tests. We'll also cover memory techniques that can enhance our ability to learn and how to deal with procrastination. We'll talk about note's taking, what are the best ways to do so, and why is self-testing beneficial for students. We'll explore illusions of learning, the drawbacks of overlearning and the advantages of interleaving (jumping back and forth between problems and situations that required different techniques) and more.

The workshop will be divided into several parts:

Part 1:

1- I'll start by asking attendants to write 5 reasons for learning.

2- Discussing with teachers about difficulties they face in their job so I can lead them to the struggle we are going to address in the workshop.

3- Watching brief video(s) to learn about memory from neuroscience point of view and make an analogy to help everyone understand what a "chunk" is.

4- Make a live demonstration about "chunking", by giving teachers a new information, and guide them through it then highlighting the fact that what they just did is building a "chunk".

5- Then all together, interacting to find similar examples of small chunks in the subjects we teach.

6- The next step will be to try to link between the small chunks. To do that I will give some carefully chosen riddles and we'll try to solve them together. This activity will allow teachers to understand why some students are usually trapped when it comes to solving a problem. This will show how solving riddles is important in building logic.

Part 2:

It might be easy to introduce an information, make a small link and then close the circle. This means that the idea is there, understood and ready to be used; the challenging part is to know when to use that information and how to use it, out of hundreds of other information. And that's where the whole struggle lies: by the time we teach students another information, the old one seems lost, it feels they need to dig far to find it, how fast can they do that? And are they able to remember it in the first place? How good are they in recalling? And did they dig the right information? There are ways to answer all those questions and we will learn about the essentials that are needed to do that and why small chunks are being lost during the process

instead of being linked to one another. What we will discuss in this part will also explain why students don't do well on a test although they studied hard.

1- We'll start by an explanation on how to build solid chunks in long term memory.
2- Then talk about the importance of recalling, the illusion of competence, mini-testing and the value of making mistakes.
3- Apply what is learned for now, by playing a game called gravity, where attendants will be able to use simple physics to free a ball. The game requires problem solving, testing oneself and learning from mistakes.
4- Discuss the importance of motivation, the answers to the "5 reasons of learning" asked previously, the disadvantage of overlearning and the importance of interleaving.
5- Introducing procrastination, understanding its cognitive psychology and learn how to tackle it.
6- Have a discussion with attendants to summarize what was presented so far, in order to:
    a- Figure out what are the things that students do wrong while studying and which have a negative impact of their learning process.
    b- Self-evaluate our job as educators, are we giving the right instruction? Are we teaching them how to study for a better learning?

Part 3:

1- Show some mistakes we encounter while correcting papers. Especially mistakes that show lack understanding of math when it comes to using it elsewhere.
2- Explore links between subject, mostly between Math and Physics, where the math fits in physics and vice versa, how can Math and Science teachers work together to help students for a better understanding. I will give examples and tips on how we can improve understanding the math through problem solving in Physics.
3- Present interviews that I made with maths and physics teachers about this topic
4- Highlighting that subjects can be linked through non-academic activities as well such that games programs, etc. :
    a- I will present a part of a project made by my students using a program called "GIS" where they linked 3 subjects: coordinates in math, geography of Lebanon and history of the Lebanese war.
    b- Show a part of a Ted talk where an employee figured how to apply Newton's laws in marketing.

Finally, we'll go back to the start; learning how to teach is important for teachers, learning how to learn is as important for students, guiding them to do that is a part of our mission as educators.

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Innovative Ideas Sessions

Inquiry-based Teaching and Learning of STEM Concepts Using Adequate Resources.

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Knowledge in Science, Technology, Engineering and Mathematics (STEM) is becoming crucial for students' academic success and preparation for workforce in the 21st century. Furthermore, the integration of STEM disciplines into K-12 education has the potential to markedly increase student interest, motivation, and achievement in these fields due to the relevance to real-world problem solving (NRC, 2009). In this interactive session, the participants will be introduced to STEM instruction and its positive impact on students. Divided into groups, they will work cooperatively to solve STEM inquiry through hands-on activities. They will also be able to differentiate between different types of STEM inquiry and their usage in classrooms. Participants will receive STEM resources that could help them integrate STEM instruction in their classrooms efficiently and with minimum effort. To thrive in a highly technological world, integrating STEM in school's curriculum is a must to deepen conceptual understanding and produce innovative and life-long learners. By using the right resources, integrated planning and continuous professional learning opportunities, teachers can create the right approaches for STEM and expect outstanding and rewarding results.

Introduction:

Knowledge in Science, Technology, Engineering and Mathematics (STEM) is becoming crucial for students' academic success and preparation for workforce in the 21st century. Educators nowadays sense the impact of technology on the education field, this explains the increase in the number of robotic and technology clubs in Lebanon and around the world. However, this demands an integrated STEM implementation in the school's curriculum to impact the teaching and learning process.

A research study done by Moore, Harwell and Guzey (2014) highlighted the importance of STEM through the *Frameworks* published by the National Research Council which state that "engaging in the practices of science and engineering during their K-12 schooling should help students see how science and engineering are instrumental in addressing major challenges that confront society today" (NRC, 2012, p. 9).Furthermore, the integration of STEM disciplines into K-12 education has the potential to markedly increase student interest, motivation, and achievement in these fields due to the relevance to real-world problem solving (NRC, 2009).

Students' interest and motivation contributes to their success in learning and retaining STEM content (Bell, Lewenstein, Shouse, & Feder, 2009). This conforms the results of a study done in Lebanon where eight grade students who were taught in a STEM approach showed a slight improvement in the science achievement and more importantly showed a great enthusiasm and excitement towards science learning (Kandil, 2016).

Unlike traditional teacher-centered classrooms, inquiry based instruction is basic for STEM classes success. Inquiry-based instruction is a pedagogical approach that combines the curiosity of students and the scientific method to enhance the development of critical thinking skills while learning STEM curriculum (Warner & Myers, 2012, p.1) through problem-based learning. Students are given a problem and asked to come up with creative solutions for it or are given the choice to produce a product or develop a solution that demonstrate their learning.

According to Morrison (2006), students who have access to STEM education should be problem solvers, innovators, inventors, self-reliant, logical thinkers, and technologically literate. I am sure Lebanese students have all the qualities and are more than ready for such a rewarding challenge.

Strategy:

Different strategies are used in the session including: Cooperative group work(each participant is assigned a role), Student-centered learning activities, problem-based learning, think pair share, KWL chart, Use of phone applications, use of laptops provided/or phones to access the internet, videos.

Description of the session:

Activity	Participants' involvement	Duration
1) Introduction: KWL chart Brief description of STEM and the objective of the session.	Participants write on sticky notes what they know about STEM and what do they want to know and stick on the KWL chart.	5 min
2) Activity 1: STEM - In groups of 5, participants are given role tags to chose and wear. - STEM Tasks are distributed with rubrics and material needed. -Presentations	-Participants divide the roles among each other and discuss ways to solve the task. They check the rubric and use the allocated time to finish the task needed using their Science, Math, Technology and Engineering skills . -Some participants present their work and discuss key concepts.	15 minutes 5 minutes
3)Mini Activity: Using Twitter, participants take 2 minutes to answer a question about STEM.	Participants use their phone to answer an open-ended question using twitter.	5 minutes
4) Activity 2: What kind of inquiry?	Participants are given STEM problems, they have to discuss and sort and stick the problems	10 min

	according to the level of inquiry: Structured inquiry, guided inquiry or open inquiry. Discuss as a whole group	5 min
5) Activity 3: Design your own STEM lesson using the universal design for learning.	Participants are given laptops, list of online STEM resources, math and science standards, rubrics, Criteria Cards for STEM Topics, and a lesson plan template following the UDL design to create their own STEM lesson and activities. Groups exchange lesson plans to assess the STEM checklist of an effective STEM instruction.	15 min 10 min
6) Distribute handouts for STEM resources + Online session evaluation	Participants are asked to fill an online survey using their phones to give their feedback regarding the session's efficiency.	5 min

Conclusion:

To thrive in a highly technological world, integrating STEM in school's curriculum is a must to deepen conceptual understanding and produce innovative and life-long learners. Does this mean more work for teachers? by using the right resources, integrated planning and continuous professional learning opportunities, teachers can create the right approaches for STEM and expect the outstanding and rewarding results.

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A Real-World Heterogeneous Mixture of Scientific Literacy, Language Barriers, and Active Learning

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Moats (2005) stated that vocabulary is "the storehouse of word meanings that we draw on to comprehend what is said to us, express our thoughts, or interpret what we read." The primary purpose of this session is to help participants apply an active learning approach to develop elementary students' understanding and application of scientific vocabulary. The strategies are hands-on activities that deepen students' understanding of science genre text, support making their thinking visible, help increase scientific exposure, and train students' on reflections by using appropriate terminology in oral as well as written explanations. The session is planned as follows: (a) Brief introduction and initial exploration of the role of scientific literacy and the factors affecting its acquisition (10 minutes); (b) Participants will be equipped with tens of strategies to enrich and practice the students' literacy repertoire and they will have the opportunity to take part in a variety of them. The tasks will help ensure the students understand, practice, embed, and reflect on the lessons covered through authentic situations (40 minutes); (c) Participants will try to plan their own strategies to a number of pre-assigned concepts (15 minutes); (d) they will present their self-constructed task and reflect on its application in their sessions (10 minutes). Pitfalls associated with active learning strategies, and possible solutions will be discussed and participants will have the opportunity to ask questions and voice concerns (5 minutes).

The primary purpose of this session is to help participants apply an active learning approach to develop elementary students' understanding and application of scientific vocabulary. Participants will play an active role in constructing their knowledge during the session; they will be guided in applying several types of activating strategies that target vocabulary acquisition that have been successful with children with dyslexia. Vocabulary is essential for communicating, reading, thinking, and learning. Moats (2005) stated that vocabulary is "the storehouse of word meanings that we draw on to comprehend what is said to us, express our thoughts, or interpret what we read." The recommended strategies will get any student engaged, challenged and motivated to learn. Humans understand words in a sequence of stages: (1) unknown, (2) acquainted, (3) established (Armbruster, et al, 2003). The purpose is to allow learners to focus on the meaning and uses of the keywords of the lesson, and to use such terms in reflecting on their learning and communicating the progress they have made and the ideas they might extend. The strategies are hands-on activities that deepen students' understanding of science genre text, support making their thinking visible, help increase scientific exposure, and train students' on sharper reflections by using appropriate terminology in their oral as well as their written explanations.
The session is planned as follows: (a) Brief introduction and initial exploration of the role of scientific literacy and the factors affecting its acquisition, misconceptions will be addressed too (10 minutes); (b) Vocabulary exposure and instruction will be contrasted and participants will be equipped with tens of strategies to enrich and practice the students' literacy repertoire and they

will have the opportunity to take part in a variety of them. The activities will help students think about the terms and not only rote memorize them. The tasks will help ensure the students understand, practice, embed, and reflect on the lessons covered through authentic situations. Handouts will be distributed when applicable (graphic organizers, mnemonics, visible thinking routines, semantic association, foldable…) (40 minutes); (c) Participants will try to plan their own strategies to a number of pre-assigned concepts (15 minutes); (d) they will present their self-constructed task and reflect on its application in their sessions (10 minutes). Pitfalls associated with active learning strategies, and possible solutions will be discussed and participants will have the opportunity to ask questions and voice concerns (5 minutes).

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Active Learning: Utilizing Technology Tools in Chemistry

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As educators, we should strive for implementing the ever changing and advancing technology that has replaced the traditional practices of a chalkboard inside the four walls of a classroom, whereby students are hesitant to boldly inquire about complicated notions and confidently express their viewpoints. In is an attempt to facilitate teachers' work and make students more engaged in the learning process, different technology tools that are used through the ongoing learning process. This workshop targets teachers seeking the usage of these technology tools as MOODLE platform, Lab simulations, Interactive videos, and computerized lab experiments. Participants in this workshop will get introduced to these tools that address all learning styles. Moreover, they will discuss the importance of these tools in enhancing students' knowledge, opening more space for discussions and helping them sharpen their skills and accomplish tasks successfully, thus creating a learning environment that is fun, innovative, creative and purposeful. The change is the only constant in this world, and if it is used for a good reason, we must support it.

Title: Active Learning: Utilizing Technology Tools in Chemistry

Some students perceive chemistry as irrelevant to their lives. Others consider learning it as too difficult and boring. The best way to engage students is to utilize authentic tasks where they become active participants in the teaching learning process. This workshop aims at increasing the awareness and understanding of the use of different Technology Tools that will improve the students' overall attitudes towards learning chemistry. Taking out the role of young learners, participants will be engaged in different activities that foster learning and understanding the different objectives/concepts utilizing various technology tools. Enough time will be given to the participants to share their reflections.
This session is planned as follows:
a) Get familiar with each other.
Brief introduction to the objectives of the workshop. **(10 min)**

b) Application of technology tools:

Tool 1: interactive video:

- Activity 1: Watching interactive videos depending on the levels that the participants teach: **(20min)**
  - Carbohydrates / Lipids (Grade 12 SE)
  - Ionic / covalent bonds (Grade 9)
  - Periodic table and properties of elements (Grade 10)
  - Galvanic cell – Standard Hydrogen electrode with Zinc (Grade 11S)

    a) Using colored cards, participants will write for what reasons are such videos important in teaching + the skills that could be acquired by students

throughout this activity and then display them on the wall of the workshop arena. (Type cards divided into reasons and skills)

b) A slide will be presented showing the importance of the use of this tool.
c) Participants will fill a post assessment sheet.

Tool 2: Lab Simulations (10 min)

After a brief discussion about the importance of this tool (Showing a slide), participants are asked to conduct different virtual labs like:

- Constructing various galvanic cells (Grade 9 + 11)
- Separating mixtures (Grade 7)
- Equilibrium – Le Chatelier's Principle (Grade 12)

Tool 3: Computerized Lab using EXAO: (10 min)

While showing a slide that shows the importance of this tool, a discussion will be done on some examples on lab experiments using EXAO like:

- Acid – Base titration using pH sensor (grade 12)
- Changing of state of pure substances using temperature sensor (Grade 7)
- Kinetic factors using pressure sensor (Grade 12)

Tool 4: Moodle Platform (20 min)

Different features in this platform are attractive to the teachers and students: Forum discussion, assignment submission, files download, URL links to different videos, educational sites, virtual labs and online quizzes. Through this platform, an authentic communication is performed with the students.

a) Showing the MOODLE platform at HHHS.
b) Showing different course applied in different class levels.
c) Presenting the importance of using MOODLE platform.

c)Ending this session: (5 min)

1- Teachers' reflection on post cards
2- Workshop evaluation.

استخدام الوحدات النمطية لتعلم بعض المفاهيم والمهارات المرتبطة بالثقافة العلمية لمرحلتين الابتدائية والمتوسطة

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تتضمن عمليات الاستقصاء العلمي التي يقوم بها العلماء مهارات كثيرة تميز عملهم مثل الملاحظة، المقارنة، التصنيف، تحديد العلاقات، استكشاف الأنماط، والتنبؤ. كما أنها تنطوي ضمنا على وضع للفرضيات واختبارها من خلال البيانات التي توفرها الملاحظات. من الأمثلة على ذلك في تاريخ العلم، تصنيف الكائنات الحية وتصنيف العناصر في الجدول الدوري. يمكن وضع الطالب في سياق مشابه لسياق وضع الجدول الدوري أو وضع تصنيف الأحياء . سيكون السياق غير مطابق، لكنه يتضمن العناصر اللازمة للقيام بالعمليات العقلية ذاتها وممارسة المهارات نفسها. من هنا جاءت فكرة تصميم وحدات نمطية، لكل وحدة مجموعة خصائص –تماما كالعنصر- ويكون المطلوب من الطلاب ترتيب هذه الوحدات أفضل ترتيب ممكن من وجهة نظرهم. ستؤدي هذه العملية بسلاسة إلى قيام الطلاب بعدد من عمليات العلم المتضمنة في الجيل التالي من معايير العلوم NGSS، سيتناقش الطلاب في مزايا كل ترتيب وعيوبه، في عدد الأنماط والاتجاهات التي لاحظوها، وسوف يتنبؤون بوحدة نمطية مفقودة. سوف يناقشون أيضا الموضع الأمثل لوحدة نمطية "مربكة"؛ حيث تسمح خصائصها بأن توضع في موضعين من الترتيب. النشاط بسيط في مظهره، لكن مستوى العمق الذي به يُتَنَاول؛ والأسئلة والمناقشات المصاحبة له، سواء بين الطلاب، أو بين المعلم والطلاب، ستضيف له الكثير من الدلالات. يمكن تدريس النشاط كدرس افتتاحي لوحدة في الرياضيات عن الأنماط للصف الخامس أو السادس، أو وحدة في العلوم يتضمن محتواها مفهوم النمط و/أو مهارات عملية العلم. كما يمكن تقديمه لطلاب المرحلة المتوسطة كمقدمة لدراسة الجدول الدوري.

بقي القول أن قيام المعلم بنفسه بتصميم الوحدات التي تخدم أهدافه التعلمية لهو مهارة مفيدة -وضرورية أحيانا- إذا أراد المعلم أن يبتكر و يطور بعض مصادره بنفسه.

المقدمة:

تهدف هذه الجلسة إلى زيادة وعي المعلمين بإمكانية تصميم وحدات نمطية يمكنهم استخدامها في تعليم الطلاب **مفهومي الأنماط والاتجاهات** patterns and trends، وهي من المفاهيم المتضمنة في الجيل التالي من معايير العلوم NGSS باعتبارها من الأفكار الشاملة لمجالات العلم والثقافة العلمية على اختلافها. كما يمكن استخدام نفس المجموعة من الوحدات لتحقيق أكثر من معيار مرحلي benchmark فعلاوة على فهم الأنماط والاتجاهات يمكن استخدامها لفهم كيفية ترتيب العناصر في الجدول الدوري، وما ارتبط به تاريخيا من التنبؤ بوجود عناصر معينة قبل اكتشافها فعليا بسنوات.

نفس الوحدات النمطية يمكن استخدامها بطريقة أخرى لتعليم المتعلمين المقصود بالاستقصاء العلمي وأركانه الأساسية من أسئلة وفرضيات وملاحظات وبيانات واستنتاجات مبنية على دليل.

كما أن إدراك معنى النمط يمثل جزء من الكيفية التي يرى بها متعلم العلوم الأحداث والظواهر مما ييسر له فهم الكثير من الموضوعات مثل الظواهر المتكررة بنمط زمني كفصول السنة وظهور المذنبات والليل والنهار، والتراكيب المتكررة الشكل والوظيفة في أجسام الكائنات الحية، ودورات العناصر في البيئة مثل دورة الكربون ودورة النيتروجين. الكثير من الأفكار والظواهر تكتسب معنىً آخر عند النظر إليها بعين الباحث عن نمط، علاوة على قدرة الأنماط على دعم تنبؤات علمية معينة.

الاستراتيجية (عمل تعاوني في مجموعات ثلاثية – نشاط عملي -)

الوحدات المستخدمة في هذه الجلسة هي 35 مربعا (طول جانبه 4سم) بكل منها رسم هندسي (مثلث، مربع، خماسي، سداسي منتظم، دائرة)، وله لون من عدة ألوان(أبيض، أحمر، أصفر، بني، بنفسجي، ازرق، أخضر، برتقالي)، ولها

مقاسات مختلفة ومكتوب أعلى كل شكل رقم ما. سيقوم المشاركون بفحص الوحدات النمطية وتسجيل ملاحظاتهم عليها، سيقومون بتصنفيها ووضعها في أفضل ترتيب ممكن من وجهة نظرهم بحيث يضم كل الوحدات، سيتامل المشاركون الترتيب الذي اقترحوه ويكتبوا من الملاحظات ما يؤيد تبنيهم لهذا الترتيب. من خلال ملاحظاتهم سيطرحون أسئلة ويجدون إجابة لها من خلال ما يتوفر لديهم من بيانات، البيانات التي ستساعدهم في التوصل لإجابة السؤال مبنية على وجود أنماط واتجاهات محددة ستظهر لهم أثناء ترتيب الوحدات مثل ارتباط لون معين برقم ما، أو زيادة الأرقام المكتوبة أعلى كل شكل بطريقة نمطية محددة. من المحتمل أن تتوصل المجموعات المختلفة لترتيبات مختلفة ولكنها جميعا ستعتمد على وجود أنماط واتجاهات.

سوف تتعامل مجموعة أخرى من المشاركين مع مجموعة من الوحدات النمطية النوعية التي تمثل كل منها نموذج للترتيب الإلكتروني في ذرة عنصر من العناصر الكيميائية، وسيقوم المشاركون بتصنيف وترتيب هذه النماذج وفق أفضل ترتيب يظهر العديد من الأنماط والاتجاهات، الترتيب الأفضل سيحقق أكثر من هدف؛ سوف يجعل المشاركين يمرون بعملية عقلية مشابهة لما قام بها علماء الكيمياء الأوائل (مثل ديمتري مندليف) عندما قاموا بترتيب العناصر في جدول دوري، كما سيخبرون قيمة النمط في عمل تنبؤات مشابهة لما قام به مندليف من التنبؤ بوجود عناصر لم تكن موجودة. سيحل المشاركون لغزاً يعتمد حله على استبصارهم للأنماط المتضمنة في الترتيب المقترح. يتضمن اللغز التنبؤ بالأشكال والألوان والأرقام التي يجب أن تكون موجودة على بعض الوحدات التي سيكتشفون أنها مفقودة ولا يكتمل الترتيب المثالي إلا بوجودها.

وصف الجلسة

تسير الجلسة وفق الترتيب التالي:

(أ) ترحيب وتقديم وعرض أهداف الجلسة وخطتها الزمنية،(5 دقائق)

(ب) يحاول كل المشاركين حل اللغز حول الوحدة المربعة المفقودة. (10دقائق)

(ج) يستكشف المشاركون النشاط المرفق (25دقيقة) حيث تقسم المجموعات إلى ثلاث فئات،

الفئة الأولى : تحاول مجموعات الفئة الأولى ترتيب كل الوحدات المعطاة لكل منها بأفضل ترتيب ممكن ويدونون في ورقة النشاط الملاحظات التي لاحظوها، والمبررات التي تؤيد اختيارهم لهذا الترتيب، يجيب المشاركون عن الأسئلة التالية: "ما الذي يتكرر أو يتغير بطريقة منتظمة أو يمكن التنبؤ بها؟"، "ما التنبؤات التي يمكنهم القيام بها، وما درجة الثقة في تلك التنبؤات؟ وما مبررات تلك الثقة؟"، "ما الذي يمكن استفادته من الملاحظات؟"، و أخيراً، ما الأنماط والاتجاهات التي نلاحظها في الظواهر الطبيعية؟

الفئة الثانية: تدون كل مجموعة ملاحظاتها التي لاحظوها بخصوص الوحدات النمطية، ثم يقومون بالترتيب الأمثل، وبعد الانتهاء يدونون الأسئلة التي جالت بأذهانهم أثناء القيام بالترتيب، سيكون السؤال الأساسي الذي يجب أن يجدوا إجابة له هو: "ما خصائص الوحدة المربعة المفقودة؟" والذي يمكنهم الإجابة عنه من خلال الملاحظات والبيانات المتوفرة لهم وستمثل الأنماط والاتجاهات التي لاحظوها دليلا قويا يدعم إجابتهم ويزيد الثقة في صحة تنبؤهم.

الفئة الثالثة: تعمل على ترتيب وحدات نمطية تحتوي على نماذج للتوزيع الإلكتروني لذرات عناصر مختلفة، الترتيب الأمثل سيساعد المشاركين في فهم طريقة توزيع العناصر في الجدول الدوري، علاوة على التنبؤ بخصائص عنصر مفقود.

(ج) تعرض كل مجموعة نتيجة النشاط الذي قامت به ويعقب المدرب ليربط بين ما تم القيام به والفائدة التطبيقية داخل غرفة الصف. فيربط نتائج الفئة الأولى بمفهوم النمط والاتجاه، وبمهارة التنبؤ، في حين يربط نتائج الفئة الثانية بالعلاقة بين الملاحظات والاستنتاجات والأدلة المستندة لبيانات متفق عليها كأساس لفهم الاستقصاء العلمي. ويربط نتائج الفئة الثالثة بتدريس الجدول الدوري وإدراك ما به من أنماط واتجاهات في تركيب العناصر وخواصها. (15 دقيقة)

(هـ) يستخدم المدرب عرض باوربوينت ولقطات فيديو توضح كيفية استخدام النشاط في غرفة الصف لتدريس موضوع الجدول الدوري وكنقطة انطلاق لتعليم الطلاب مفهوم الاستقصاء العلمي وأركانه الأساسية. (5دقائق)

(و) يعرض المشاركون آراءهم وأفكارهم حول الأنشطة التي استخدمت، وفعاليتها في تحسين التعلم، ومقترحاتهم لتطويرها و/أو لتحسين فعاليتها أو توسيع نطاق استخدامها في فصول العلوم والرياضيات. (15دقيقة)

الختام

تطبع التوصيات التي نوقشت أثناء التفاعل، مع وصف تفصيلي للوحدات وتلميحات حول طرق إعدادها وتوزع على المشاركين في الجلسة.

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Developing Literacy in the teaching and learning of Mathematics

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We aim to look at different strategies that are already in use by other practitioners to allow teachers develop literacy in the teaching and learning of Mathematics. Moreover, engaging learners in the excitement of language and teaching them to be more risk-takers in the integration is the workshop's aim. By promoting and rewarding the use of correct mathematical vocabulary in class, students become more willing to try to use key terms in the correct context. There are wonderful teaching strategies that excite learners and foster understanding. In addition, session participants will realize that literacy plays an important role in confirming the notion that math is more than computation on paper and provides opportunities for learners to develop the language of math. Thus, attendees will be looking towards math with new perspective. During the workshop, participants will enjoy various innovative activities taking on the role of the learner in some situations.

This workshop primarily aims at increasing the participants' understanding of how to teach math through literacy. This was planned to be implemented through real-life Math activities. This session will include authentic and easy-applicable strategies for classroom teachers to use and consequently achieve profound students' development in elementary classrooms. In this workshop, participants will enjoy reading various stories that promote inquiry in Math using the English language as a tool to deepen students' understandings of different concepts and skills. From the beginning till the end of the session, participants will be actively involved in interesting hands-on activities and will be divided among differentiated groups that enrich their understanding of different strategies that excite the learners.

The session is planned as follows:

(a) Brief introduction of what literacy is and the objective of the workshop (3 mins)
(b) To break the ice, attendees will watch a mini video about teaching math nowadays (3 mins) And then they will reflect on it (3 mins)
(c) Attendees will post their wonderings on the "Wonder Wall" in order to warm them up with an interesting environment (5 mins);
(d) Participants will use the Carousel strategy to work cooperatively in order to answer several questions that test their prior- knowledge about how and why we use literacy in Math and how to encourage children to represent their mathematical thinking. (10 mins)
(e) Attendees will deepen their understanding of how to develop the use of literacy in Math through exploring different resources (stories – poems – songs – magazines) to deduce different Math concepts and skills. (10 mins)
(f) Differentiated group activity will be held out on different Math stands (Numbers – Shapes – Data Handling – Measurement – Pattern) to engage participants in taking different roles (role-

play/ dramatizing, creating stories – using manipulatives – compare and contrast – etc.) (20 mins)
(g) This activity will be followed by a reflection from the participants on their mini journal. (3 mins)
(h)Participants will listen to a story and will reflect how it can be used in language and Math concepts or skills. (10 mins)
(i) Least but not last, the presenters will wrap up the session by discussing the benefits of integrating mathematics and literacy (5 mins)
(k) At last, participants will use the "Exit Card" using the strategy "I used to Think…But Now I Think"
in order to write their suggestions for improvement in their classrooms. (3 mins)

Breaking Barriers;Cultiviting Creative Scientists

Roweida Bawab and Mada Antar, HoussamEddine Hariri High School, Saida, Lebanon

As science teachers, we are fully aware that science has shaped up what we are today and that scientific discoveries have been the building blocks for all technological milestones. We of course owe all of this to the great minds of many scientists. Without Thomson searching for fundamental components of atoms and discovering the electron, we wouldn't have had electronics. Without Newton inquiring about the falling apple, we would neither have had mechanics nor been able to travel to space. Science is the sole thing that enhances our knowledge of the world around us and is simultaneously considered a beautiful and useful matter. We are pretty confident that there are Newtons and Thomsons among our students; we are certain that brilliant prospective scientists do exist in our classes, just waiting for the right opportunity and the suitable class environment.
However, are we only teaching scientific information in our classes? Or are we shaping prospective scientists that will help change the world and enlighten many yet unanswered questions? This workshop aims at shedding light on how the classroom environment can bring out the scientists in our students, feed their scientific inquiry and allow it to blossom. We want to fight the statistically proven decline in science majors in Lebanon in an attempt to plan for a better tomorrow. We want to figure out how to shape the role science subjects play in the world nowadays.

1. Introduction:

Throughout history, scientists have been viewed as introvert, plain-looking, old people who lack communication skills and are generally incapable of enjoying life. Scientists have officially lost their value as heroes and become the category no one wants to belong to. In fact, this is a real dilemma in science classes; bringing scientists out of our students is nearly the main reason behind teaching them. We need to set their ideas straight and keep them hooked on the subjects we teach so that they could grow up to shine, invent and discover.

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 (toilet roll paper introduction) and then the sequence of activities will be as follows:

a) Why Science?
   - On a slideshow, show them a group of people and ask them to guess if they're scientists (give them a laminated cardboard to write their yes or no answers)
   - Discuss the stereotypes surrounding scientists.
   - Discuss what the significance of science is and why we teach it to our students.
   - In groups, participants suggest 3 examples of scientists who changed the world.

- Share the story of Rayan Chester in Breakthrough Junior Challenge and the role his teacher played in getting him inspired.

b) Sharing Statistics:
   - Participants are given statistical data showing the decline of science majors in the university.
   - Participants analyze the data and try to come up with the reasons why we don't have many scientists amongst our students.
   - Compare results of generalized science and math tests (e.g. TIMSS and PISA), number of discoveries last year according to nationality and try to find the correlation between the quality of education in science and math and scientific creativity.

c) 1- Scientific Bible:
   - Develop relations:
     - ✓ Discussion: How do we teach people to drive? Do we directly give them a car? How do we teach people to play musical instruments? Do we directly ask them to play it?
   - Participants are introduced to the major titles in the Nature of science:
     a) What is science and what is its aim?
     b) Understanding scientific terms (hypothesis, theory, law)
     c) The objectivity of science in collecting data
     d) The human face of science
     e) The public understanding of science.

Then, they are given phrases that they need to match to each title.

2- Let them use their senses:
- Abstract does not work:
- Think of the differences between theoretical, hands-on and minds-on modes of teaching

3- Revive their curiosity:
- Distinguish between the types of class interactions that intrigue curiosity and others that don't.
- Suggest activates that will foster creativity in class.

4- Let them design their lab experiences:
- Assess the level of inquiry that our lab sessions can provide.
- Give the participants some material and allow them to predict the objectives, the procedure and possibly the conclusions of a lab experiment. Stress on the importance of lab visits in science classes and think of ways to substitute them when they cannot be feasible
- Think of ways to substitute labs when time or material is not available.

5- Scientific research:
- Conducting scientific research is a great way for discovering something new.
- Integrate mini-research papers in physics/biology/chemistry curriculum.

- Support students by launching a school research center where students get proper guidance and resources.
- Give the audience a group of descriptions of situations and ask them to change it into a problem. Devise the research question in it and discuss the importance of research in science classes.

4. Conclusion:

Use post-it notes to brainstorm means that we can teach a student who is going to grow up and become a scientist. (Put "creating scientists" in the middle of a roll paper and add the post-its around it)

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