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BLENDED LEARNING: WHERE TRADITION MEETS TECHNOLOGY

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BLENDED LEARNING: WHERE TRADITION MEETS TECHNOLOGY

Ever since the World Wide Web started making inroads into our homes and schools, researchers and practitioners have been exploring ways to combine both traditional and new ways of teaching. How can we blend the best of both worlds? What happens when tradition meets technology?

Article highlights

What is blended learning?
Is this approach really viable in Singapore schools?
What gains does technology bring to the classroom?

"21st century learners call for 21st century teachers." This has been the impetus behind the review of teacher education at NIE and the mandate for both school teachers and teacher educators (NIE, 2009).

While this does not mean that traditional classroom-based teaching is obsolete, its use as the sole learning delivery tool is fast becoming outmoded.

But as much as teacher-fronted instruction is no longer the only mode of imparting knowledge, e-learning alone cannot possibly address all our pedagogical concerns. That's where blended learning comes in - where tradition meets technology.

Recommendation 4: Programme refinements and an extended pedagogical repertoire:

In NIE's report on a teacher education model for the 21st century (TE^{21}), the need for teachers today to widen their pedagogical repertoire is highlighted. This is necessary for enhancing teaching and learning for the 21st century.

There is increased recognition of the changing nature of content - in terms of accessibility, advancement, and conditions for bringing about new learning. Given the changing nature of knowledge, learning, and the profile of learners in the new environment, the way we teach needs to change (NIE, 2009).

To equip teachers with a range of instructional strategies needed for classroom teaching, NIE has mapped out a framework of approaches and practices to ensure that appropriate and effective pedagogies are used in the classroom.

Blended learning is one of several approaches. It has the potential to integrate inquiry and reflection, and simulate authentic experiences for learning.

Misconceptions About Blended Learning

So, does incorporating technology in *any* form - PowerPoint slides, CD-ROMs or videos - constitute blended learning? Or do we need to re-examine the ways we use new technology for teaching and learning?

Associate Professor (A/P) Philip Wong, who is also the Associate Dean for Pedagogical Development and Innovations at NIE, distinguishes between *ICT-based learning* and true blended learning. He considers much of what students are experiencing in Singapore schools as ICT-based learning.

"I wouldn't say students are exposed to blended learning," notes A/P Wong. "I would say teachers are using technology to *enable* and *support* learning for students."

A/P Wong defines blended learning as a combination of e-learning with face-to-face teaching. "Students learn content through exploration, e-learning, problem-solving, and then go deeper and have in-depth discussions with their teachers on a certain topic," he explains.

The e-learning element in this approach to learning allows students to learn at their own pace, time and convenience. Thus, for this model of learning to be successful, A/P Wong believes that students need to be motivated, self-disciplined and self-directed.

So, What Is Blended Learning?

The rapid technological developments over the past years have opened up many doors for teaching and learning in schools today. Blended learning is an approach that is gradually gaining in popularity.

But while this phrase has been used in educational circles for a while now, surprisingly, not everyone agrees on its definition.

In its essence, blended learning is a mix of different learning environments, involving the combination of traditional pedagogical methods and new learning technologies.

New Frontiers In Learning

As an increasing number of students are gaining access to computers and the Internet, blended learning has the potential to be applied at every level of education.

New media opens up new possibilities in the classroom. Teachers can include relevant curriculum content that would otherwise be unavailable or difficult to comprehend if not for the use of the Internet or an interactive whiteboard.

The use of Internet resources, in tandem with face-to-face teaching, extends learning beyond the classroom.

"The Internet offers different opportunities than just textbooks alone as it really opens up the whole world to the students," says A/P Wong. "Students can now Google and go into depth on a certain topic. Complex processes and procedures are made alive and this can help students understand the concepts better."

Integrating new technologies allows for greater interaction. Students and teachers can interact in real time and asynchronous modes (Matheos & Archer, 2004).

Blended learning also alters the act of learning. This self-directed learning process trains students to be independent learners, and thus develops a necessary skill for the future.

Learning in a virtual community

Beacon Primary School is an example of a Singapore school that has incorporated blended learning in its pedagogical approach. Beacon Primary is one of the first schools under the FutureSchools@Singapore initiative.

Beacon Primary leverages on technology to enhance its teaching-learning processes. One example is *BeaconWorld*, an immersive and interactive 3D virtual environment that is designed to provide a safe online space for pupils to learn as a community, express themselves creatively, and actively explore new concepts and ideas (Lui, 2010).

BeaconWorld has modules like the Personal Interactive Enrichment Book, which is a digital content reader that allows teachers and pupils to create, read and annotate e-textbooks (Goh, 2010).

It is envisioned that *BeaconWorld* will encourage pupils to learn anytime and anywhere, and thus develop into independent learners.

Leap Forward With Technology

Blended learning certainly offers a means to incorporate the "best of both worlds", to create an appealing environment for teaching and learning.

Although there is still a long way to go before blended learning gains ground at all levels of education, the foundations are already being laid. By exposing our students to new ways of learning, we are equipping them to be self-motivated learners beyond the walls of the classroom.

Education is all about teaching and learning in ways that are most beneficial to our students. If blended learning can help to do that, then can we afford not to consider it? Where tradition and technology meet, you can be sure that's where learning occurs.

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Read more about the TE[21] recommendations in our previous issues of *SingTeach:*

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The Competent Teacher
Reflection: Thinking about Doing
Mentorship: A Practical Solution

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COMPUTER GAMES IN THE MATH CLASSROOM: ARE YOU GAME?

Take charge of your own restaurant! Or go on a quest to save an endangered race! All this during class time? Our pupils are engaging in these activities - virtually, of course - and learning some math at the same time.

Article highlights

Can computer games help in learning math?
How is learning more effective with computer games?
What are some considerations when choosing a suitable computer game?

We love a good game for the simple reason that it's fun. Wouldn't it be great if you could have fun while learning? Computer games that allow pupils to apply mathematical principles while gaming certainly fulfil this criterion.

But the market is flooded with commercially produced computer games - many are poorly designed or have unsuitable content. This can make choosing a suitable game a challenging task.

How should teachers choose computer games that will help in learning math? And will using them necessarily make learning more effective?

Using Technology To Support Learning

In this knowledge-driven era, the use of technology as a teaching tool will only increase in importance.

Research has shown that computers can help to support learning by engaging pupils in the learning process (Roschelle, Pea, Hoadley, Gordin, & Means, 2001). There is evidence that the use of computer games is effective in getting children more motivated and engaged in learning math concepts (Egenfeldt-Nielsen, 2007).

For math, one of the aims is for pupils to develop mathematical problem-solving skills. For this, pupils need to acquire and apply math concepts and skills to solve non-routine or real-world tasks.

Computer games as a teaching tool offer the opportunity to effectively impart these math concepts and skills.

Exploring The Potential Of Computer Games

While teaching at St. Anthony's Primary School in 2006, Ms Chang Suo Hui and her colleagues started an Internet café for the pupils.

The initial aim was to promote the Innovation and Enterprise spirit of creativity and inquiry in the pupils. During the course of running the café, however, Suo Hui discovered the potential of enhancing pupils' learning of math through computer games.

Curious as to how commercially produced computer games can be used to teach math skills, Suo Hui embarked on an exploratory study (Chang, 2009).

She chose a few pupils to participate in this study. For 1 week, each pupil spent about 2 hours after school every day playing three selected computer games. They each kept a log of their gaming activity. An interview session was conducted after the week.

Learning Skills And Concepts

Suo Hui analysed how different games can help pupils learn different math skills, concepts and processes.

They learned the skill of data analysis through a role-play game, the concept of angles through an action and simulation game, and the process of looking for a pattern using an adventure and quest game.

For example, one of the games was set in a restaurant. One pupil said that by looking at the line graph, she knew that the aim was to make sure that the line representing profit should go up. This meant that the restaurant was making a profit.

Suo Hui found that pupils who were usually uninterested in math persevered at working through complex computations or problem-solving tasks. They displayed visual skills which they did not usually show in class.

Choosing the right game

Some teachers may be at a loss when it comes to choosing suitable computer games for their pupils. How can teachers make sure that the selected games are effective?

Suo Hui shares some useful tips she picked from her study. "They might be useful for the adventurous teacher who wants to attempt to use computer games in teaching math."

- Assess the content
  - Select games that do not contain undesirable themes, language and animation.
  - Look for games that cover a broad range of math skills, not just mastery of specific skills.
  - Consider how the different skills or processes needed in the game align with the math syllabus at each level as well as on the whole from Primary 1 to 6.
- Build familiarity with the game
  - Take time to fully understand the demands of the game components until you are familiar with them.
  - While playing, note down the various thinking processes or mathematical skills required to play.
- Create opportunity for play
  - Curriculum time may not be sufficient for the use of computer games. Provide alternative places and time for students to play the game (e.g., at home or in an Internet café).
  - Create a community of practice for students. They can learn how to move on to higher levels in the game from one another.
  - Look out for opportunities to facilitate learning, like subtly providing hints on math skills.

Further Exploration

Suo Hui, who is currently a teaching fellow with NIE's Mathematics and Mathematics Education Academic Group, cautions that more research needs to be done in this area locally.

"It is still very much at an exploratory stage, to figure out the possibility of integrating math learning and computer games," she says.

Research also shows that to make learning with computer games useful, other aspects need to be developed hand-in-hand, such as improvements in curriculum, assessment and teacher development (Roschelle et al., 2001).

It would be helpful for teachers to collaborate with researchers and curriculum specialists to make the infusion of technology into schools a success.

Teachers who are interested in incorporating game-based learning into their teaching can contact Suo Hui.

Useful resources

These are some of the commercially produced games played by pupils at St. Anthony's Primary School's Internet café and the math skills they relate to:

- *Restaurant Empire*, a role-play strategy game, covers topics such as percentage, graph, measurement, numeracy and heuristics (working backwards).
- *Pearl Harbour*, an action and simulation game, covers topics such as geometrics.
- *Zoombinis*, an adventure and quest game, covers topics such as heuristics (looking for patterns, guessing and checking, deducing and comparing, making a list) and thinking skills (classifying, analysing part and whole).

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BEYOND TEXT: ICT REDEFINES LANGUAGE TEACHING

Are you getting tired of teaching mother tongue language using textbooks alone? If you feel uninspired, then chances are your students do, too. Rapid advances in the use of ICT are introducing new possibilities for creating stimulating learning environments.

Article highlights

What benefits does ICT offer in language education?
How can voice technology be integrated into mother tongue language teaching?
What are the benefits of using this technology for language teaching?

The promise of information and communications technologies (ICT) in improving language learning has recently come into focus as a result of the Mother Tongue Language (MTL) debate.

Ms Ho Peng, Director-General of Education and Chair of the MTL Review Committee, has noted that ICT will play an increasingly larger role in the teaching and learning of mother tongue languages (Koh, 2010).

"Children in fact connect very readily and easily with ICT. So, I think in terms of teaching and learning in the classroom, we really need to use ICT to engage the next generation," said Ms Ho.

The Potential Of ICT In Language Education

Engaging in authentic communication is an essential criterion for language learning and teaching.

The use of ICT can help make learning language more realistic and functional. By adapting our teaching goals, methods and assessments to incorporate new technologies, language learning becomes more alive and relevant to daily living.

But the effective integration of ICT is a complicated and, for some, difficult process. Many just do not know where to start when this process involves not just technology but also teacher competencies, pedagogy and curriculum.

Adopting A Web-Based Solution

Dr Roksana Bibi Abdullah has been using an ICT tool known as Wimba Voice Tool to enhance her Malay language teaching.

Wimba Voice Tool is a web-based voice solution that includes the use of threaded voice boards and live group discussions and debates (Abdullah, 2009).

Roksana, an Associate Professor with the department of Asian Languages and Cultures at NIE, has found that the software provides many advantages.

"My students and I have found Wimba so easy to use," shares Roksana.

Putting Wimba Voice Tool to good use

Roksana was first introduced to Wimba Voice Tool in a pilot study conducted by NIE's Centre for IT in Education. She continued using the software after discovering its many advantages.

Roksana shares how she uses the software in her class:

Students are asked to bring their laptops to class.
Students are divided into groups and given a general topic to explore and tasked to produce a verbal post on it using Wimba.
Students then proceed to listen to their group members' posts and provide comments online.

Roksana teaches the pre-service module "Use of Malay Language". She has to make sure her students are comfortable with *Sebutan Baku* (standard Malay pronunciation).

"Malay language users use colloquial Malay in their informal interactions. In order to give them a platform to use standard Malay pronunciation, Wimba Voice is my best solution," she says.

Unlike many virtual learning environments, where communication between students and instructors is limited to only text and static images, Wimba makes use of voice and sound. Roksana has found this extremely useful in the teaching of pronunciation, where the nuances of the human voice are critical.

"Nuances of voice, which are important elements in face-to-face communication, are missing from text-based discussions. I found that Wimba Voice Tool recaptures these elements, contributing to greater clarity and understanding," shares Roksana.

The Benefits Of Teaching With Wimba

According to Roksana, the vocal element of Wimba also allows students to become actively engaged with the course content. She found that her students no longer feel "burdened" with assignments. Not only do students not complain about their assignments, they actually do more as they enjoy using Wimba so much.

With Wimba, students have the opportunity to listen to and provide verbal comments in real time. Roksana has also taken advantage of the ability to post her feedback online.

More importantly, Wimba has helped Roksana to fairly assess her students on their communication skills.

"I have a big group of students and it is impossible to assess each student one at a time. Wimba has saved me a lot of time when it comes to assessments," says Roksana. "I feel that I can give better and fairer judgments as I can conduct a succession of assessments, and not just base it on one presentation."

This software has provided the class with an opportunity for creative teaching and effective learning.

Raising Proficiency With Technology

Technology can offer effective benefits in almost all areas of language education and there is much for teachers to explore. When used appropriately, ICT can assist greatly in improving the quality of language education.

Commenting on the teaching of MTL, Minister for Education Dr Ng Eng Hen (2010) said: "Language teaching should aim to produce proficient users. This means teaching students to communicate with others, listen and read with understanding, and present in spoken and written forms."

Roksana's experience with Wimba has demonstrated how ICT can enhance language learning by providing a platform for active learning and promoting better learner engagement. It also encourages interaction among students and teachers.

In the context of today's language classroom, it certainly is a useful and novel way of creating a more authentic learning environment - by giving our students a voice.

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SCIENCE LESSONS WITH A HUMAN TOUCH

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Article highlights

How can we bring technology into the science classroom?
How can iMVT move students closer to scientific practices?
How is this learning process different from traditional practices?

Technology To Teach Science

Science and technology are companions, without question. So what better way to help students learn with greater ease than by integrating technology into the teaching of science?

iMVT - inquiry, Modelling, Visualization and Technologies - is one such example. This pedagogy effectively integrates modelling, visualization and technology with inquiry-based learning.

Developed by the MVT research team from the Learning Sciences Laboratory (LSL) at NIE, the researchers envision an enhanced way that science students learn and science teachers teach.

Instead of mere descriptions or static images of science concepts in textbooks, iMVT utilizes easily accessed software that students interact with, allowing them to visualize abstract ideas, such as the world at a molecular level.

Dr Zhang Baohui, who leads the MVT team, says, "iMVT addresses student learning difficulties by engaging them in scientific practices." By doing this, it also promotes a student-centred classroom.

Familiarizing Students With Scientific Practices

iMVT is being used in four collaborating schools. Its appeal among these schools stems from the customized workbooks and curriculum designed by teachers and LSL researchers, as well as a senior specialist from the Ministry of Education's Curriculum Planning and Development Division.

Using the iMVT framework, researchers and teachers work together to create customized workbooks for Biology, Chemistry, and Physics classes to suit the student profiles. Various software (see Useful resources) are integrated into these workbooks.

For example, a workbook on "Acids and Bases" was created for Coral Secondary's students. In the lesson "How to Measure the Acidity?", the workbook first lays the foundation by presenting basic content knowledge of acidic, neutral and alkaline solutions.

Students are encouraged to hypothesize the results before running simulated tests. They then continue to a computer laboratory activity to check pH levels in 10 solutions using the online *pH Scale* program (see Figure 1).

Students then place their findings in a table, thereby learning about the properties of acids while inculcating critical science thinking skills as they attempt to predict the results.

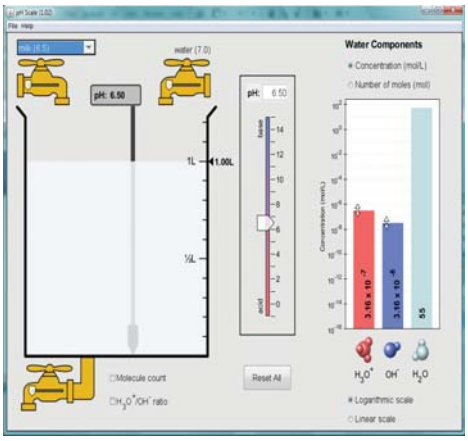

Figure 1. Acidic content for milk generated by the online *pH Scale* program.

The simulated models generated by the software help to represent and construct an understanding of science phenomena as complex systems. This allows them to visualize, internalize and become familiar with the topic.

Personalizing Learning For A Student-Centred Classroom

Active use of technology, with the workbooks as a guide, also creates an engaging environment, where students can work together and even challenge each other's thinking. "This gives students a 'voice' to express what they have learned," says Baohui.

"Most students like this kind of learning because there are a lot of hands-on activities and the simulation helps them to understand better," notes Ms Ye Xiao Xuan, a member of the MVT project team.

Another project member, Ms Chia Pei Chun, comments, "One of the many advantages in learning science through iMVT is that it enables students to grasp more abstract concepts."

Through this process, students *own* what they learn as they play an active role in constructing their own learning. It becomes a personal learning experience for them.

Breaking Barriers In The Science Classroom

Now in its fifth year, the MVT project has embarked on a second phase. Baohui and his team note that the 29 participating teachers are pleased with the marked improvements students have made, even though the project has had its share of difficulties in trying to sustain and scale up the iMVT innovation.

"Generally, it is quite a success," says a Chemistry teacher from Coral Secondary School. "Most of the students are more interested in hands-on rather than whiteboard learning. They are more engaged."

"It is a worthwhile approach," notes the Head of Science at the School of Science and Technology, Singapore, of the use of iMVT with the Secondary 1 students, "but as we are embarking on the initial phase of implementation, we will need to provide sufficient scaffolding to nurture the students' inquiry and critical thinking mindset."

Bringing students and science closer

Using iMVT's modelling and visualization methods, with the help of easily accessible technology and tailor-made workbooks, has helped students build an intimate grasp of scientific practices. And the students are loving it.

"I like it this way!" says one Chemistry student from Greenridge Secondary. "This way is more innovative, as our teacher does not spoonfeed us anymore, letting us think by ourselves and do it for ourselves."

"How I wish *every topic* has software like this for teachers to use," adds a Maris Stella High Biology teacher.

Building teacher capacity

The use of iMVT has also been helpful for the teachers in other ways. It enables them to see misconceptions that students may have about certain topics when students voice their opinions.

Furthermore, iMVT can be used for building teacher capacity and community. Teachers who were in the first phase of the project have now become mentor teachers, helping new participating teachers in the use of the iMVT pedagogy.

They also use an online forum to discuss teaching methods and difficulties. The teachers are building a community that supports each other, professionally and personally.

The MVT project has proven that using technology can breathe new life into teaching and, especially, into learning science. This has helped to close the gap between students and scientific practices, and between teachers and the curriculum.

Surprisingly, technology has also helped to bring a human touch to Science lessons, by bridging the gap between teachers and students, breaking the barriers that prevent teachers from connecting with students.

For more information on the MVT project, contact Dr Zhang Baohui or check out LSL's website.

Useful resources

These are some of the software that the MVT team has used in their workbooks. The project team thanks the creators of the programs used in the project.

For learning of acids and bases: http://www.chemcollective.org/applets/vlab.php
For simulations of different subjects: http://phet.colorado.edu/
For the *pH Scale* program: http://phet.colorado.edu/en/simulation/ph-scale
For learning abstract and particle-related topics: http://workbench.concord.org/
For web-based inquiry science with project-based learning resources: http://wise.berkeley.edu/
For a multi-agent programmable modelling environment: http://ccl.northwestern.edu/netlogo/
For computer modelling tools for secondary level science learning: http://mac.concord.org/

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NEW WAYS TO LEARN IN THE 21ST CENTURY

A "new" education system focusing on students is the flavour of the day, empowering them to be learners who act, and not passive recipients. We take another look at the evolving educational landscape and see how research in Singapore schools is redefining the way we learn.

Looking Back At Tradition

Research emerging from the field of learning sciences is redefining the way we understand how students learn in the 21st century.

"In the traditional classroom learning environment, students are simply passive," says Associate Professor Victor Chen, Head of the Learning Sciences Laboratory (LSL) at NIE.

The traditional classroom is based on a top-down structure where the teacher is seen as the only source of knowledge who should not be challenged, while students merely reproduce information they have received.

But with the changing times, we realize that this will not help tomorrow's students, who need to be active participants in their learning. We need to focus on facilitating learning.

In the 21st century classroom, this top-down approach to learning and teaching needs to give way to new relationships between learners and teachers.

Moving Beyond The Past

Findings from LSL research projects can help to enlighten us on two key areas: *21st century learning* and *21st century pedagogy*.

Examples of 21st century learning include: (a) Knowledge Building, (b) New Media Literacies, and (c) Game -based Learning.

Examples of 21st century pedagogy include: (a) Productive Failure, (b) Student-created Models, and (c) Play-Dialog-Performance.

These new approaches to learning and pedagogy may be combined in powerful ways - bringing them forward into the 21st century.

Pairing Knowledge Building And Productive Failure

LSL research has found that learning through *Knowledge Building* (KB) increases student motivation to learn. Students take ownership of their learning when they understand that they can contribute to the pool of public knowledge, or even challenge it.

KB may be paired with *Productive Failure* (PF) pedagogy. Victor explains, "PF is based on the premise that it can be more effective when we allow students to explore learning without providing immediate scaffolding."

By allowing failure as students try to build knowledge on their own, especially at the outset, students start to learn by and for themselves.

The teacher adopts the role of *collaborator* and *facilitator*, allowing students time and space to explore, providing an encouraging presence, and helping only when absolutely necessary, but students control their learning progress.

Balancing New Media Literacies And Student-Created Models

The research on *New Media Literacies* (NML) in learning shows that students need more opportunities to explore alternate media for learning, meaning making and knowledge construction.

Students who are exposed to interactions online (such as social chat rooms or peer-to-peer messaging) are found to have developed a personal voice or identity online. This, in turn, benefits their face-to-face interactions in the real world.

Teaching using *Student-created Models* (SCM) balances well with NML. Based on inquiry learning, this pedagogy allows students to build their own representations of knowledge. Students learn to develop an individual voice or identity as each student produces a different model.

Combining NML learning with SCM teaching balances the scales of power - traditionally seen to only reside in the teacher - by shifting some of it to the students. They are empowered to learn in their own unique ways.

Partnering Game-Based Learning And Play-Dialog-Performance

In *Game-based Learning* (GBL) learning, as the name suggests, students learn through playing games.

As the game environment provides opportunities to enact assigned roles (such as leaders), this type of learning develops different skills (such as leadership).

"This leadership role can also be expanded to a broader learning outcome of forming identities. Students are engaged in on- and off-line identity construction in a positive way - they are more likely to view themselves as leaders or empowered learners," says Victor.

Try partnering GBL with *Play-Dialog-Performance* (PDP). Allow students to first *Play* without prior instructions from teachers, then engage them in *Dialog* about their thoughts and reflections, and let them *Perform* real-world tasks that were simulated in the games.

Victor explains, "This model is beneficial for higher order thinking and real-life problem-solving skills development."

By partnering GBL and PDP, students bring their positive identities formed in the games into the real world, where they can quickly apply their newly learned skills. They may then progress to higher order thinking skills and take on more advanced problems to solve.

Advancing With The Times

The times are changing and so must our way of teaching. The teacher can no longer be the only source of knowledge; this role must now be passed on to the student.

The new role of a teacher is to facilitate learning. In this educational landscape, students learn not because they are told to, but because they are responsible for themselves. Students of the 21st century must be the ones who steer their own learning.

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