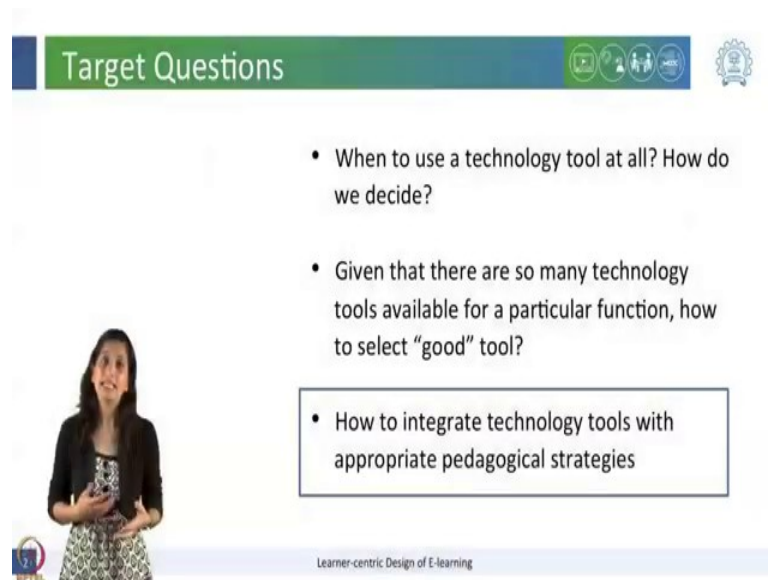


Designing learner-centric e-learning in STEM disciplines
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Lecture - 22
Effective Integration of Technology

Hi, in our last LED we discussed on how instructional designer should understand the unique features and affordances of technology tool and how it can be used to enhance the learnings in a specific content domain for learners.

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The slide features a green header bar with the text "Target Questions" in white. To the right of the header are four circular icons representing different educational themes. Below the header, there are three bullet points listed on the right side. On the left side of the slide, there is a small video inset showing a woman, Dr. Veenita Shah, presenting. At the bottom left is the IIT Bombay logo, and at the bottom right is the text "Learner-centric Design of E-learning".

- When to use a technology tool at all? How do we decide?
- Given that there are so many technology tools available for a particular function, how to select "good" tool?
- How to integrate technology tools with appropriate pedagogical strategies

Learner-centric Design of E-learning

In this LED we will talk further on the integration of technology in e-content in an effective manner.

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Reflection Spot

An instructional designer created an e-learning content comprising 5 concept videos (45 min each), additional reading material, a simulation and a quiz for learners. He used highly sophisticated and appropriate technology tools to create this content, which is also accessible by all learners.

Is this enough to be called as “Effective Integration of Technology?”

- Yes
- No

Learner-centric Design of E-learning

Before we learn more on that let us do a reflection spot. An instructional designer created an e-learning content with 5 concept videos of around 45 minutes each provided additional reading material, assimilation and a quiz for learners. He used highly sophisticated and appropriate technology tools to create this content which is accessible to all learners. Now is this enough to be called effective integration of technology.

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Discussion on Reflection Spot

Positives

- Appropriate technology tools
- Various learning components
- Accessible to all learners

Pain points

- Long videos
- No mention of activities within the videos
- Other learning activities (e.g. LbDs) missing

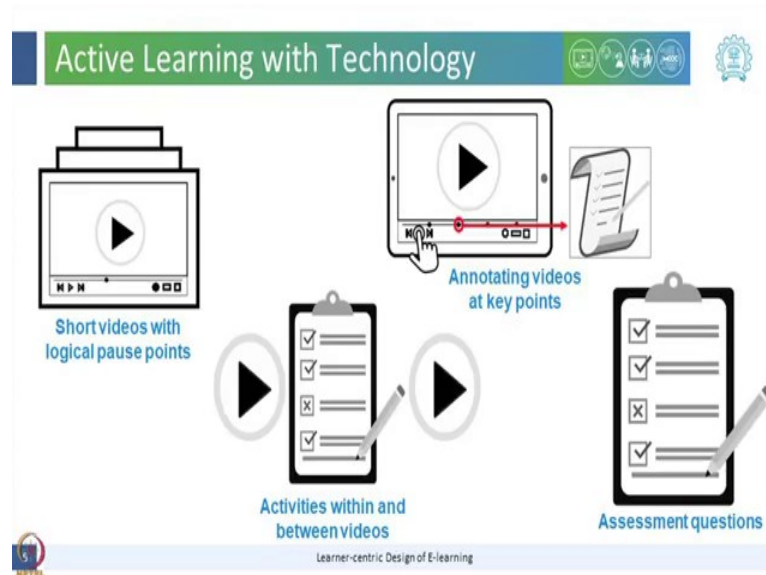
Active learning Missing!!

Learner-centric Design of E-learning

Now, some of you would have said yes because the instructional designer seemed to have conducted the analysis of the technology tool affordances, as it is written that he used appropriate technology tools, the instructional designer also used various different components of learning such as videos, reading material, simulation, a quiz and in addition the content is also accessible to all learners.

However, if you have said no I would agree more to that since the video seem too long which may disengage the learners, there is no mention about indisposed activities within the videos, there is no mention about other activities which involved active learning. Active learning based online or blended learning often involves the use of videos, reading material, where learners should be made to do something rather than mere watching of videos or reading of content; many of these pedagogical strategies have being discussed explained in the week 2 and week 3 content. However, here we are going to briefly reiterate the integration of technology with pedagogy in an effective manner.

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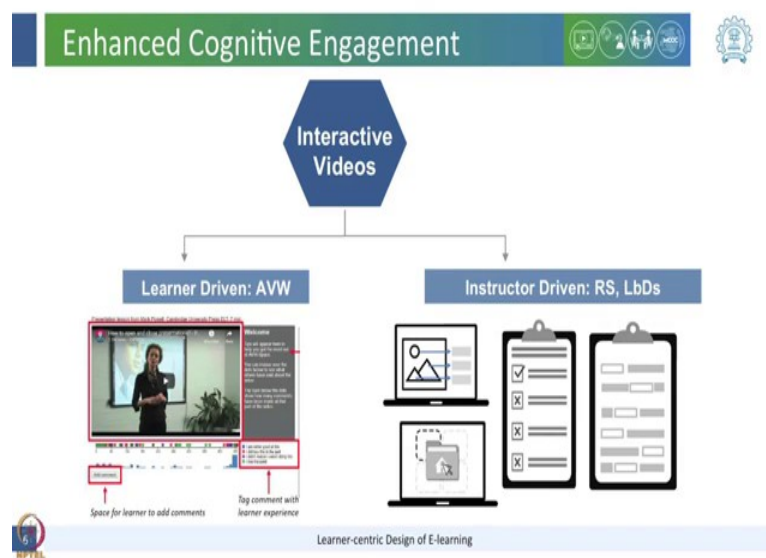


Technology can support active learning where the learner actively participates and interacts with the content. E-content comprising videos should not include long videos, but short videos after identifying logical breakpoints. Videos can be annotated at key points so, that a jump between sections of the videos as possible for learners. Activities should be interspersed to within and

between videos with constructive feedback for learners. Designers should incorporate formative and summative questions in between different videos and activities again with constructive feedback.

The addition of these small elements ensures that technology affordances support the learners to go beyond mere, watching of videos or reading of content and allows them to actively interact with the content.

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As discussed previously these interactive videos can be instructor driven including different kinds of reflection spots or LEDs such as annotating an image, drag and drop, multiple choice questions or filling the blanks. Reflection spots can be incorporated using different technology tools such as h 5 p as we have done for our course where the video is paused. For the learner to answer the question and the video resumes after the learner has answered to the reflection spot.

However, you should make sure that the appropriate feedback is provided in the videos following the reflection spot which addresses common expected answers for the reflection spot. These interactive videos can also be learner driven that is the active video watching which we discussed last week where learners are made to add comments, share their learning experiences with the comment; this also leads to enhanced cognitive engagement with the content.

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Reflection-based learning

Reflection Activities
Which of the following strategies did you implement during your presentation?
A) I maintained eye contact with my audience
B) I appropriately altered my tone of delivery
C) My body posture portrayed confidence in my delivery
D) I was able to maintain positive outlook avoiding distractions

Enter the result score in the above

Main Screen | Self-Report Scores | Save | Load Activity | Next Activity

Training
Analysis
Activities
Quit

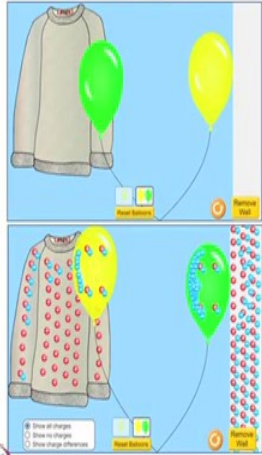
Source: A virtual reality-based Training Application

Learner-centric Design of E-learning

We have discussed about reflection and articulation as pedagogical strategies in e-learning. Reflection can also be targeted by incorporating open ended activities to be performed in an e-content. Here is one example of a reflection activity provided to learners in an e-content that entailed a virtual reality based application designed to improve learners oral presentation skills. This reflection activity asks the learners to list down some of the strategies that they implemented during their presentation. Such activities motivate the learners to reflect on their own knowledge structure and how they can build on what they know.

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Connecting to Real-world Learning



Simulation: Real-world information through simulated environments for real-world experience

- Technology should go beyond learners being able to manipulate the variables
- Use of simulation should help in effective understanding of the concept

<https://phet.colorado.edu/>

Learner-centric Design of E-learning



Providing rich real world information of complex environments for real world experience through visualizations is one of the technological implications of the constructivist approach. Incorporation of simulation is one of the examples of achieving this goal; however, in order for effective integration of technology one thing that needs to be mean sure is that the technology support should go beyond learners being able to manipulate the variables and that the use of simulation should help in effective understanding of the concept.

In the example shown here, the image on the top allows the learner to play with the variables move the two balls around have the wall or remove the wall. However, the underlying concept of static electricity only become more evident once the charges in play are shown as seen in the bottom image. This is one example which shows how effective design and integration of technology is critical.

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Construct Your Own Understanding

- Connections between ideas
- Connecting new ideas to knowledge
- Organising ideas in a logical structure



Learner-centric Design of E-learning

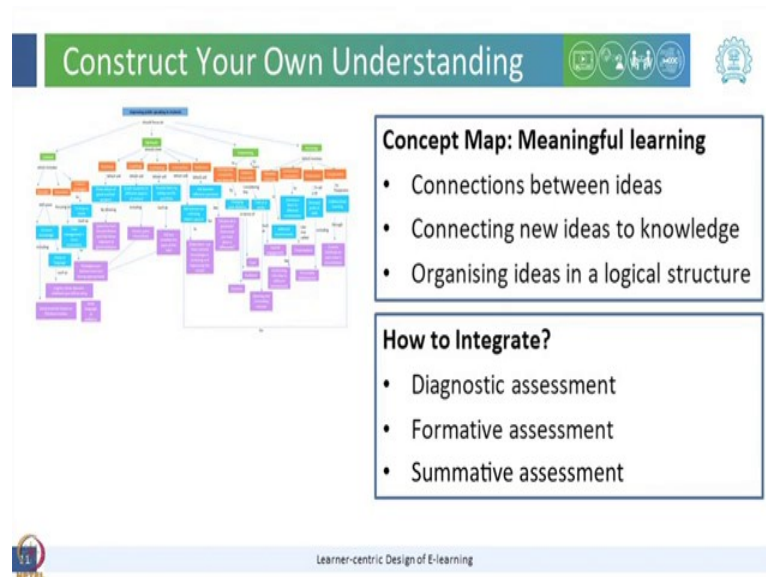
If you use a visual representation tool such as a concept map this will help learners in seeing connections between the idea that they already have. Connecting new ideas to knowledge, organizing ideas into a logical structure all of which will lead to meaningful learning.

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Here is an example of a concept map which describes the different aspects to be focused on in order to improve public speaking skills and students. It elaborates on each of the aspects like content, methods, sequencing, sociology which are involved in public speaking.

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Now, such a concept map can be integrated into learning content with different learning goals. You may start with the topic by asking the learners to construct an initial concept map which provides diagnostic assessment as well as leads the learners to think over the content. A partially constructed concept map can be provided as formative assessment after some content has been covered to understand learners understanding, misconceptions also learners can be asked to create a concept map on the entire topic as a summative assessment task.

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The slide is titled "Collaboration via Technology" in a green header bar. Below the title, on the left, are logos for a generic user icon, Facebook, and "et itb Educational Technology, IIT Bombay". In the center is a screenshot of a "padlet" digital wall with various educational resources pinned to it. On the right, the text "Effective orchestration is important" is followed by a bulleted list of five strategies. The bottom of the slide features a blue bar with the NPTEL logo and the text "Learner-centric Design of E-learning".

Collaboration via Technology

Effective orchestration is important

- Steering discussions with focus question
- Interact with learners
- Structured collaborative group activities
- Peer review providing descriptive rubrics
- Conducting live interaction sessions
- Follow up on desired learning resources

padlet

Learner-centric Design of E-learning

As discussed earlier there are several technology tools performing online communities, performing collaborative activities such as Google classroom, discussion forum, Facebook accounts, padlet etcetera. However, the important thing to remember is that effective orchestration of the same should be focused. One such strategy which is followed in this course involves steering of discussion with the focus question and providing clear instructions to the learners to interact with their peers interact with the learners frequently during online discussions.

Design collaborative group activities for learners and ask them to conduct peer review by providing them descriptive rubrics. Conducting live sessions for learners where all learners can come together or at one time point view each other's comments, queries and learn from their peers. At the same time the instructor should also follow up and provide them with the desired learning resources.

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E-Learning Content for Classroom





Visualizations lead to improved learning only if used 'effectively'

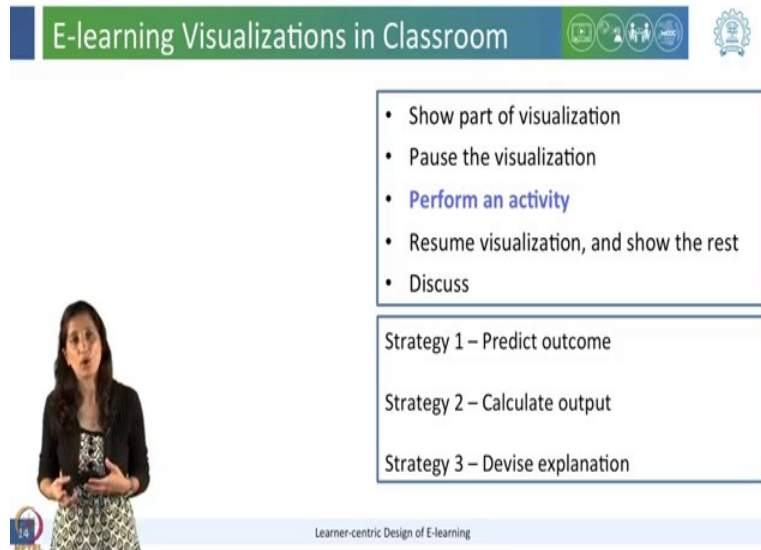
- Mere demonstration/playing/viewing is not enough
- Student interacts directly: Inquiry-based activities
- Teacher plays visualization: (for ex in lecture), use active-learning strategies



Learner-centric Design of E-learning

For using e-learning in classroom it is essential to remember that visualization is going to lead to improved learning only if used effectively. Mere demonstration playing viewing of the visualizations is not enough. If the students are directly interacting with the visualization such as homework or lab work then teachers should integrate it with inquiry based activities. However, if the teacher is playing the visualization in the class or a lecture then active learning strategies should be incorporated.

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The slide features a green header with the title "E-learning Visualizations in Classroom" and several icons. On the left, there is a small video inset of a woman presenting. The main content is organized into two boxes. The top box contains a bulleted list of five steps, with the third step, "Perform an activity", highlighted in blue. The bottom box lists three strategies: "Strategy 1 – Predict outcome", "Strategy 2 – Calculate output", and "Strategy 3 – Devise explanation". A footer at the bottom reads "Learner-centric Design of E-learning".

E-learning Visualizations in Classroom

- Show part of visualization
- Pause the visualization
- **Perform an activity**
- Resume visualization, and show the rest
- Discuss

Strategy 1 – Predict outcome

Strategy 2 – Calculate output

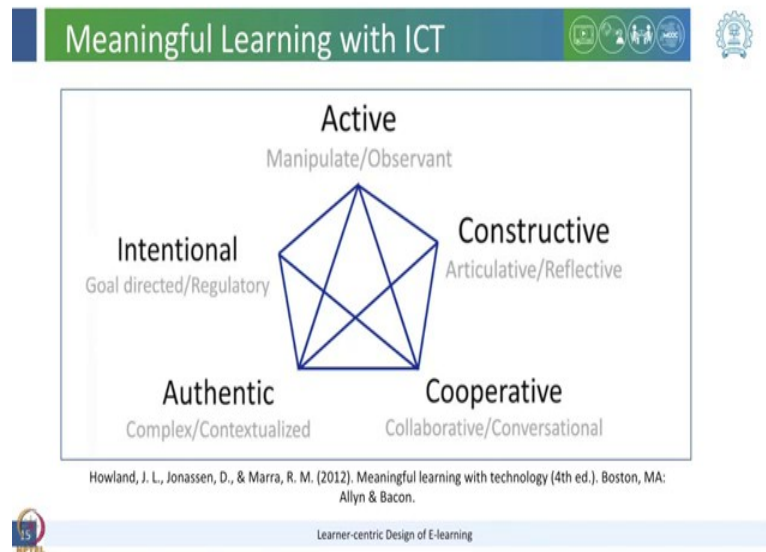
Strategy 3 – Devise explanation

Learner-centric Design of E-learning

The steps for one such pedagogical approach have been listed here which involves showing a part of the visualization by the instructor, pausing the visualization, asking the learners to perform some activity and then resume the visualization and show the rest and discuss about the phenomenon with the students. Three different strategies which can follow these steps have been mentioned here. This involves strategy 1 which is predict outcome where during the activity phase the students predict the outcome of a phenomenon which was shown to them in the visualization.

Strategy 2 which is calculate output where during the activity phase the students are asked to calculate the output or next step of the process which is shown to them in the visualization. Or strategy 3 which is device explanation where, during the activity phase the students device and explanation for a given process or phenomenon which was shown to them through visualization. One such strategy should be chosen based on the pedagogical purpose and the learning outcome. Coming back to learning with the ICT; how learn ICT team in 2012 proposed 5 dimensions that characterized how ICT could support meaningful learning.

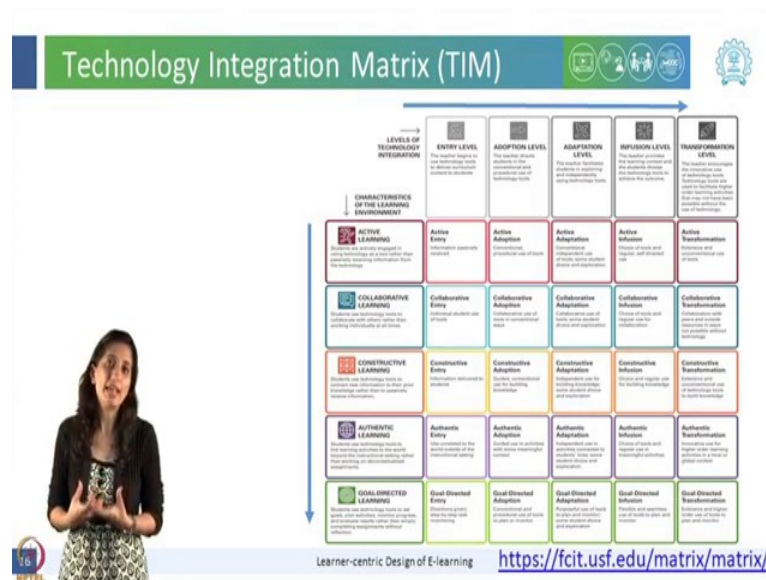
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These 5 dimensions of meaningful learning included active learning where learners actively engaged with ICT content, working with the objects and information and observing results. Constructive learning well learners construct their own knowledge through self reflection and articulation.

Cooperative learning where learners work with their peers to learn. Authentic learning where learners engaged in the solving of real world problems and goal oriented learning where learners set their learning goals and planned their learning pathways. In our course we have covered most aspects of these 5 dimensions of meaningful learning with ICT.

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Based on this theory of meaningful learning with ICT a framework named technology integration matrix has been developed to measure the 5 levels of technology integration. This technology integration matrix incorporates 5 interdependent characteristics of meaningful learning environments and associated them with 5 levels of technology integration that is entry adoption adaption infusion and transformation. Together the 5 characteristics of meaningful learning environments and the 5 levels of technology integration creates this matrix of 25 cells to assess technology integration.

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Rubric for Meaningful Learning with ICT					
Dimension	0	1	2	3	4
Active	Students passively receive subject matter from media or ICT all the time	There is sporadic use of ICT tools by students to work with subject matter	Students are using ICT to work with subject matter half the time	There is substantial use of ICT by students to work with subject matter	Almost all lesson time involves students using ICT to work with subject matter
Constructive	ICT tools used for transmission of subject matter rather than meaning-making	ICT tools used to support reproduction of subject matter or convergent knowledge expression by students	ICT used to support some degrees of divergent knowledge expression by students with respect to the subject matter	ICT tools used by students to synthesize information in order to construct verbal, written, visual, conceptual or product-oriented expressions of the subject matter	ICT tools used by students to articulate their personal reflections of subject matter in the form of verbal, written, visual, conceptual or product-oriented expressions
Authentic	No representations of real-world phenomena or problems related to the subject matter are presented with ICT tools	ICT tools used to present examples of real-world phenomena related to the subject matter of students	ICT tools support students to investigate real-world phenomena or problem related to the subject matter	A problem associated with a real-world phenomenon related to the subject matter is used to anchor the activity and students investigate the real-world phenomenon with ICT tools in order to propose solutions	Students represent their personal experiences of the real-world phenomena/problems related to the subject matter with ICT tools
Intentional	Students do not use ICT tools to support them in diagnosing, strategizing about or improving their learning gaps of the subject matter	Students' learning gaps of the subject matter are being diagnosed by teachers or peers	Students self-diagnose their learning gaps of the subject matter by using ICT tools/resources	Students use ICT tools/resources to self-diagnose their learning gaps of the subject matter. Therefore, they use to fix their learning gaps	Students continually use ICT-based tools/resources to self-diagnose and fix their learning gaps of the subject matter
Cooperative	No cooperative activity over ICT platforms/tools or ICT tools/platforms are used to share information and resources related to the subject matter but an online discussion occurs	Students work together either around the computer or through the computer in activities requiring convergent knowledge expressions of the subject matter	Students work together either around the computer or through the computer in activities requiring some degree of divergent knowledge expression of the subject matter	Students work together either around the computer or through the computer in activities requiring a large degree of divergent knowledge expression of the subject matter	Students work together either around the computer or through the computer in activities requiring primarily divergent knowledge expression of the subject matter

Koh, J. H. L. (2013). A rubric for assessing teachers' lesson activities with respect to TPACK for meaningful learning with ICT. *Australasian Journal of Educational Technology*, 29(6), 887-900

Learner-centric Design of E-learning

Here is another rubric based on the theory of meaningful learning with ICT that contributes towards a design of e-learning content. Such rubrics can act as design scaffolds to incorporate effective integration of technology into the e-learning design which can lead to meaningful learning. We hope that you have gained a fair understanding on how to select a technology based on its unique features and affordances and how to focus on effective integration of technology considering the interaction between technology content, pedagogy and the learners.

Thank you.