

Designing learner-centric e-learning in STEM disciplines
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Lecture - 19
Addressing Diversity

One of the thorny problems that we encounter when we design e-learning and in e-learning context is that the learner is not in front of us. In fact, none of the learners are in front of us and we do not exactly know who they are. This problem of course, gets enhanced a lot because of the context that it is not a face to face situation and it also that this challenges, it looms when we have diverse learners.


Now, if the e-learning context suppose it is a part of a blended course where you frequently meet your learners maybe this problem is not so daunting. For example, if you are designing e-learning for your 7th standard students where you meet them every day and the e-learning is supplementary, it may not be such a big problem. But if you are teaching an online course for example, or if you have adult learners from a variety of fields that you do not that you are not very familiar with then this problem becomes, this challenge becomes difficult to address.

So, in this learning dialogue let us look at the issue of addressing diversity in our learners in an e-learning context. Before we move ahead let us pause at a reflection spot.

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Reflection Spot

- Think of the face to face classes you have attended and the type of students you have learned with



- What are the different characteristics of the learners in the class?
- If you are a teacher - How do you ensure that they all learn?

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Think of a face to face class that you have participated in either as a student or as a teacher and think of the various types of students that you have interacted with in that class. What are the different characteristics of the learners in that class? In what ways were they different can you categorize them in any way. And especially if you were a teacher how did you address there is differences and how did most importantly how did you ensure that they all learnt. So, think of a more familiar face to face context and please write down some of the points to these questions when you are done you can resume.

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The slide features a title bar at the top with the text "Discussion of Reflection Spot" and several icons. On the left side, a woman in a blue dress is speaking. The main content is a bulleted list:

- Diversity :
 - gender, culture, country, socio-economic background
 - Background and interests – different strengths or limitations – prerequisites vs learners of advanced topics
 - The differences make students learn differently
 - Implications in the teaching process

At the bottom left is a small logo with the number 3, and at the bottom center is the text "Learner-centric e-learning in STEM".

You may have thought of diversity along various dimensions some of them are apparent like age, gender, maybe the culture from which students come from that may not be so apparent, but perhaps you know about it. Maybe their socio economic background again these have certain implications. Now, the other thing as a teacher or as a fellow student you may have paid attention to is the varied background, varied backgrounds of the various learners in the face to face class.




The various interests because of which students may be present in the class; teachers would definitely have paid attention to the idea to the fact that some learners need support in the prerequisites whereas, others are more advanced or fast and they want to move ahead. Now, these differences have implications on learning and on engagement they make because of these differences students may learn differently.

In this in the rest of this learning dialogue let us see how to address these differences in an e-learning context. Let us look at the various ways in which learners are different in which there is a diversity among our learners in any e-learning context.

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Diversity of learners in eLearning

- Online courses attract learners from diverse backgrounds
 - time zones;
 - language;
 - location of learners: urban, remote;
 - college students vs part-time students;
 - full-time professionals vs home-based workers;
 - fast vs slow learners
 - Prerequisites – advanced topics
 - Enrol in MOOC for certification / personal interest



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If it is an online course like a MOOC for example, there are differences in the time zones from which people log in. You know that this is something that we cannot think of in a more familiar face to face setting. There may be differences in language, in location of learners are they in urban areas, remote areas, which country they are from. Then if you move to their professional background it may be college students full time college students or part time students it may be professionals or home based workers.

The backgrounds may be different in terms of prerequisites versus advanced topics like in the face to face context. Students may enrol in an online course because of various reasons, some of them may do it out of personal interest, for some it may be required at their jobs and yet another, yet others may do it because of the certification. So, there are differences along all these dimensions when we come to an e-learning context.

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Why should we address diversity?

- Differentiated needs for diverse learners
- Diversity enhanced in e-learning contexts, leading to a greater transactional distance
- Ensure continuous and accelerated learning
- Different learning resources improve learning
- Acknowledge diversity to increase learner-centeredness

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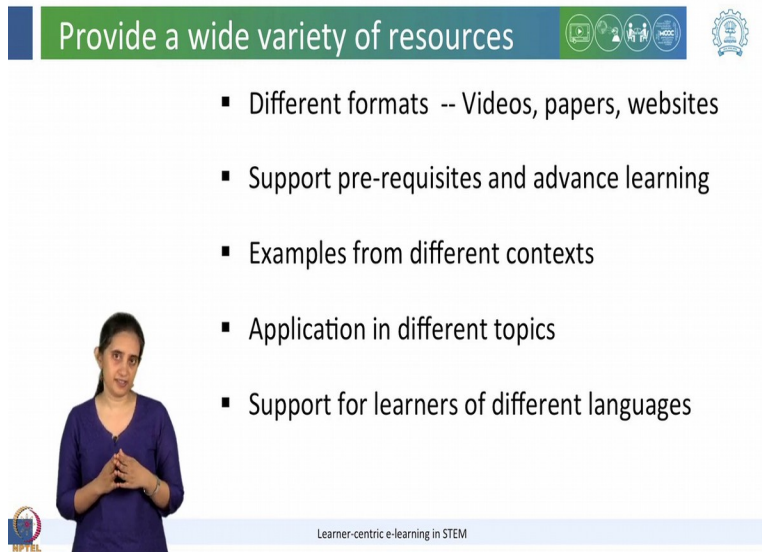
Why should we address this diversity? We know that different learners have differentiated needs and this problem gets amplified in an e-learning context also because of the transactional distance. It is also known that when we address the individual needs of a learner then learning is improved, engagement is enhanced and at least there is support for continuous learning within this medium. Also it is important to acknowledge this diversity when we say that we are designing using a learner centred approach.

So, we do know that we have to address this individuality, but now the question is how do we do it especially in this medium where the numbers may be large or the diversity may be extremely varied and we may not know who these learners are. When we come to the issue of how to address this diversity the first thing we need to do as instructional designers of e-learning is to try to figure out who our learners are and then see which ones we really want to address first and next we can prioritize.

Its great if we want to address all our learners, but it its fine if we say that our priority are these learners, but before we are able to do any of those we need to know who they are. So, often in e-learning courses and online learning, there is an entry survey you would have encountered that even in this course it may be about demographics, it may be about background, personal interests why do you enrol in this course. So, that helps the instructional team learn the cohorts, the

groups of learners present within their e-learning context. One of the recommendations that you may have heard often to address diversity is to provide a variety of resources.

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The slide features a green header with the text "Provide a wide variety of resources". To the right of the header are four circular icons representing different media types: a video camera, a document, a person, and a globe. Further right is a circular logo with a gear and a person. Below the header is a list of five bullet points. To the left of the list is a photograph of a woman in a blue top, with her hands clasped. At the bottom left is a small logo with the letters "HPTIL". At the bottom center, the text "Learner-centric e-learning in STEM" is displayed.

- Different formats -- Videos, papers, websites
- Support pre-requisites and advance learning
- Examples from different contexts
- Application in different topics
- Support for learners of different languages

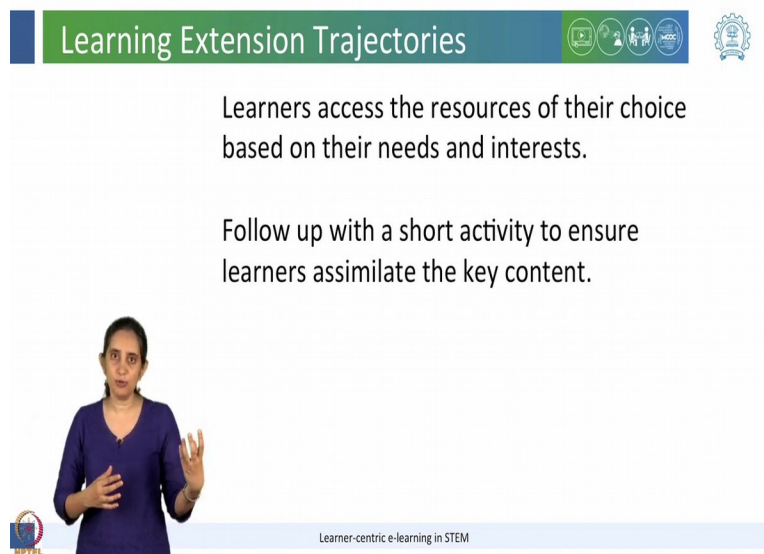
Now what do we mean by variety? It could be learning resources in different formats such as videos, websites, text. So, this is just the medium the format in which the resources provided. So, you can you can provide a variety of those. You can provide learning resources and learning activities to support prerequisites for some learners as well as to encourage advanced learners to learn more. So, that is why I knowing who the cohorts are, what the cohorts are is important, you may feel you may learn that there are maybe three different types of learners in terms of the backgrounds and provide a set of activities for each of them.

One of the recommendations that you may have often heard of to address diversity is to provide a variety of learning resources and learning activities. Now, what does a variety, what does variety mean here? In what ways can we provide these various resources? So, if we think of the dimensions one of the things we can do is to provide resources in different formats or different media like videos, websites, text, pictures it could be similar content or related content, but we can vary the medium and include activities and resources in different media within the same course.

Another way to address diversity especially in terms of background is to make sure that we support the needs, the prerequisite needs of some learners as well as encourage the advanced needs of other learners. We can borrow from the scratch terminology here and talk of designing for low floor high ceiling and wide walls. We can also provide examples and applications in various contexts and if we know that our learners come with different interests this is something we should do that when we give examples or when we give our students to work on applications of a part particular concept, we vary the context in which the application happens.

We can also support learners in terms of their varied language needs if that is not important criterion within your learners. While it is great to provide a variety of resources its known from studies as well as our personal experience as teachers that it is not enough to simply provide resources the additional reading, the references we know that many a time students just do not access them or maybe they will look at it in a cursory fashion. So, we have to find a way to ensure that learners actually access this variety of resources and gain from it. One solution here is that of learning extension trajectories which you would have experienced in this course itself.

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The slide features a green header with the title "Learning Extension Trajectories" and several icons representing different educational fields. Below the header, there are two main text blocks. The first block states: "Learners access the resources of their choice based on their needs and interests." The second block states: "Follow up with a short activity to ensure learners assimilate the key content." At the bottom left, there is a small image of a woman in a blue top, and at the bottom right, there is a small logo for NPTEL and the text "Learner-centric e-learning in STEM".

Learning Extension Trajectories

Learners access the resources of their choice based on their needs and interests.

Follow up with a short activity to ensure learners assimilate the key content.

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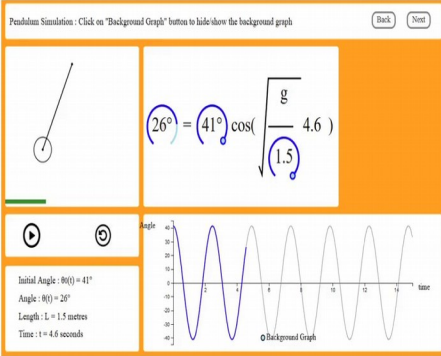
So, the way we design learning extension trajectories is to provide resources for different needs of learners with where it is deliberately designed. And, then we allow learners to access the resource of their choice or do the activity of their choice and we close the learning loop by giving

a short activity in this case we call it an assimilation quiz to ensure that they have actually read the text or watch the video and assimilated the learning from it.

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Multiple representations

- Same entity is represented under different aspects within the same system
- <http://philogb.github.io/jit/> (interactive data visualization)
- <https://www.visualizefree.com/> (use publicly available data or use your own data to create interactive visualizations)



The screenshot shows a pendulum simulation interface with the following components:

- Diagram:** A simple diagram of a pendulum with a bob and a string.
- Equation:**
$$26^\circ = 41^\circ \cos\left(\sqrt{\frac{g}{1.5}} \cdot 4.6\right)$$
- Graph:** A plot of angle (in degrees) versus time (in seconds). The angle oscillates between approximately -30 and 30 degrees over a 14-second period.
- Parameters:** Initial Angle = $80^\circ = 41^\circ$, Angle = $80^\circ = 26^\circ$, Length = $L = 1.5$ metres, Time = $t = 4.6$ seconds.

https://lsr_lab.gitlab.io/pendulum/Code/Screen%203.html

Learner-centric e-learning in STEM

Another technique that people use is multiple representations in stem disciplines where the same concept is presented in different formats such as graphs, equations, texts, diagrams. And here in fact, this is not only for diversity multiple representations and having learners, translate back and forth, interpret various representations is also known to be effective for deeper conceptual understanding.

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The screenshot shows a video conference interface. At the top, there is a green banner with the text "Go blended" and several circular icons representing different educational or technological concepts. Below the banner, the main content is divided into three sections:

- Face to face interactions**: This section includes a "YouTube Live" link (<https://www.youtube.com/>) and a list of activities:
 - From doing your gmail account, create a YouTube channel
 - Complete the required settings
 - Share the Channel link to your learners
- Video Feed**: A central video feed shows a man in a dark shirt speaking. The background of the video feed includes the text "e-studio IIT Bombay" and a small Indian flag.
- Top chat replay**: A list of chat messages from participants, including questions and responses related to the course design.

At the bottom of the interface, there is a source link: [Source: https://youtu.be/4dXcz5WkiZE](https://youtu.be/4dXcz5WkiZE) and the NPTEL logo with the text "Learner-centric e-learning in STEM".

If you are designing learning materials for an online course you know where it is on a platform like this NPTEL course. One important recommendation is to go blended at least to some extent. So, this means that do not limit yourself only to the online medium, have some ways at least a few where there may be a synchronous interaction either face to face if you can if that situation is possible or via videoconferencing.

In this course we are using Google hangouts you can do Facebook live. So, inserting a few of these synchronous interactions where there is at least some face to face contact, it could be a via VC medium that is again known to be beneficial to address diversity as well as the transactional distance. And, this improves what is known as learner connect; however, different each learner is he or she feels that yes I am part of the course.

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The slide features a green header with the title "Recommendations for IDs". To the right of the title are four circular icons representing different learning modalities: a person at a computer, a person at a desk, a person at a desk with a laptop, and a person at a desk with a tablet. Further right is a circular logo with a gear and a person. The main content is a bulleted list of recommendations. On the left side of the slide, there is a small image of a woman in a blue top, with her hands clasped, standing in front of a white background. At the bottom left of the slide is the NPTEL logo, and at the bottom center is the text "Learner-centric e-learning in STEM".

Recommendations for IDs

- Become aware that you may have a diverse range of learners
- Prioritize if needed, and design to engage all learners
- Include a variety of learning resources and activities
- Increase learner connect
 - face to face sessions
 - Different learning resources
- Represent the content in many ways.
 - The more diverse are the examples, the more effective is the learning.

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As we design e-learning using a learner centric approach some of the recommendations that we have to keep in mind, are one that we should become aware that there may be a diverse range of learners who will be accessing, who will be experiencing the content that we have created. Then we have to try to identify this diversity and entry surveys were one way of doing so.

If you want at this point we can prioritize the learners who we will primarily address, then we include a variety of learning activities and resources addressing the needs of each identified cohort. We can represent the content in different ways using different formats, different media and all this is important to enhance learner connect. So, we include some key some or many if possible face to face sessions using various options available.

Thank you.