

Designing an Interactive Learning Management Platform to Strengthen Learner Engagement in Higher Education

Mayuri Dongre, Hrutuja Meshram, Vidhi Ugale
Dept. of MCA
Nagpur University, Nagpur, India

Abstract — Digital transformation is really changing the way we learn in education. This is why Learning Management Systems are so important now. Even though a lot of schools are using Learning Management Systems they often do not keep students because the content is not interactive and it is not personalized for each student. This paper is about a kind of Learning Management Platform that we call Interactive Learning Management Platform. The Interactive Learning Management Platform uses four ideas to make learning more engaging for students: combining different ways of teaching, making the content fit each student's needs, using games to make learning fun for students, analysing how students learn. We based our ideas for the Interactive Learning Management Platform on what other researchers have found and, on theories that are well established. We think that our Interactive Learning Management Platform can really help students stay engaged when they are learning online. We talk about how each part of our Interactive Learning Management Platform's based on research and how all these parts work together to help students. Our goal is to help students behave think and feel in a way that makes them want to learn. At the end we discuss how to make our Interactive Learning Management Platform a reality and what we need to do to test it.

Keywords— learning management platform; learner engagement; blended learning; adaptive e-learning; gamification; learning analytics; higher education.

I. INTRODUCTION

The use of technologies in higher education has changed the way institutions teach, deliver and evaluate learning. Learning Management Systems or LMS are now the way to share course materials give evaluations and track student progress. Moodle, Canvas and Blackboard are examples of LMS that provide tools for delivering courses. However, research shows that these platforms often lead to students passively going through the motions, which can reduce their long-term interest in the course. The traditional way these platforms are structured, with a focus on content does not help to keep students engaged over time. Learning Management Systems like Moodle, Canvas and Blackboard are widely used, their limitations can lead to a decrease, in student involvement. Institutions are looking for ways to improve student engagement and outcomes through the use of Learning Management Systems.

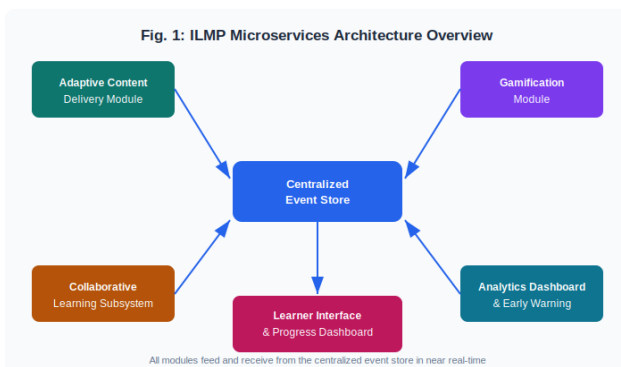
Digital technologies have transformed education and Learning Management Systems are a big part of that change.[1]

Learner engagement is something that people think is complicated. Scholars say there are kinds of learner engagement. There is engagement, which is when people do things they are supposed to do. Cognitive engagement is when

people think hard about what they are doing. Then there is emotional engagement, which is how people feel about what they are doing. If we make a plan that includes all three of these things it will work a lot better. We should focus on why people want to learn and help them keep trying. This is better than focusing on one thing. There are a lot of theories and ideas that already talk about this. The Community of Inquiry model says that people need to feel like they're part of a group and they need to think about what they are learning and they need good teachers. All of these things are. Important for learning online. Some research says that if we make things for each person they will learn better. Other research says that using games can make people want to learn more if we use the games in a way. And research on looking at data says that if we look at how people doing, we can make better choices, about how to teach and learn. Learner engagement is important. We should think about all of these things when we try to help people learn.

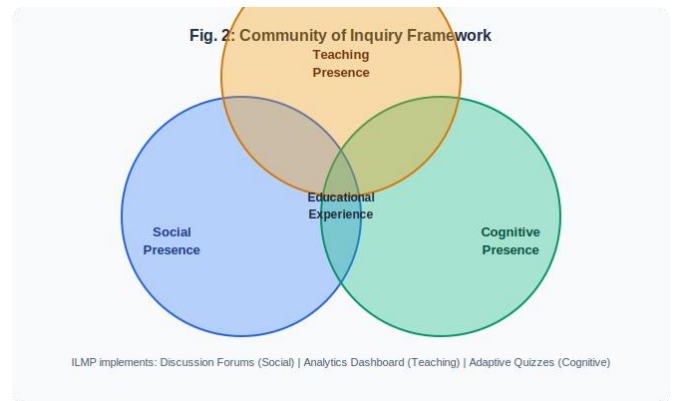
1. Blended Learning and Technology-Enriched Instruction
Blended learning is when you combine teaching in a classroom with activities that use technology. This is a way of teaching that has become very popular in colleges and universities. Dziuban, Graham, Moskal, Norberg and Sicilia say that blended learning is a way to teach students. Blended learning works well because it brings together teaching in person and learning with technology. Blended learning is a part of higher

education today because it uses the best of both worlds, which is teaching in a classroom and using technology to learn. The idea of learning is that it combines these two things to help students learn in a better way. Blended learning is important, in education today because it helps students learn by combining classroom teaching and technology.[1] Blended learning is not about finding a schedule that works for everyone. It is a different way of teaching that is made possible by new technologies. The people who studied this say that blended learning has some features that make it different from other ways of learning. These features are being able to learn at your pace being in charge of your own learning and being able to get information right away. What is important to note is that schools are starting to use learning more and more because it lets students interact with each other and with teachers in a way that is just as good as or even better, than what happens in a regular classroom. Blended learning is special because it uses technology to make learning more flexible and it gives students control over how they learn. The fact that blended learning can collect information in time is also a big advantage. Blended learning is becoming more popular because it offers a lot of benefits that other ways of learning do not.



2. The Community of Inquiry Framework

Garrison, Anderson, and Archer [2] proposed the Community of Inquiry framework as a model for meaningful learning in online environments. The framework says there are three parts that work together: social presence, which is about participants feeling like real members of the community and being able to connect with each other; cognitive presence, which is about learners creating their own understanding through careful and critical thinking; and teaching presence, which is about guiding and directing the learning and social processes to achieve good educational results, with the Community of Inquiry. The Community of Inquiry framework helps create a learning environment.



The Community of Inquiry framework has an impact on how we design an Interactive Learning Management Platform. If a platform does not let people interact with each other it limits the conversations that help people learn and think together. For teachers to be really effective they need to know what the learners are doing at all times so they can step in when needed. The Interactive Learning Management Platform has tools for people to work together and a dashboard to track progress and these are based on the Community of Inquiry idea that we need to make sure people can interact with each other with the teachers and with the material than just hoping it happens on its own. The Community of Inquiry framework is important, for the Interactive Learning Management Platform design.

3. Adaptive Content Personalization

A big problem with Learning Management Systems is that they treat all learners the same way. Vandewaetere, Desmet, and Clarebout [3] conducted a review of research on how learners differ in computer-based learning that adapts to each learner. They found that differences in what learners know how they think, why they learn and how they control their learning interact in complex ways with how the learning is designed. Their analysis shows that no one way of organizing or presenting content works best for all learners. Ignoring these differences hurts a number of learners, in any group. Shute and Towle [6] Let's talk about the types of adaptive system architectures. We have systems that change the order of lessons, systems that change how detailed the material is and how it is presented and systems that make practice problems easier or harder based on how you do on tests.

The people who studied this say that the best adaptive systems can do all these things at the time. The Adaptive Content Delivery Module of the ILMP does this by looking at how you spend on a task your test results and what you do on the system to make your learning path just right for you. It changes both the order of the lessons and the way the material is presented to

suit your needs. Adaptive systems like the ILMPs Adaptive Content Delivery Module are really good at helping you learn because they can adapt in ways. Adaptive system architectures are important for making sure you get the most, out of your learning experience.

4. Gamification as a Motivational Mechanism

People are getting really interested in something called gamification. This is when you take things from games like points and badges and use them in places that're not games. You can also use leaderboards to show how people are doing and progress indicators to show how along they are. The reason people, like this idea is that it can help keep learners motivated when they are using computers or other digital things. Gamification is a way to make learning more fun. It is being used more and more. The idea of gamification is to make people want to keep learning by using game like things. Dichev and Dicheva [4] conducted a review of studies on using games in education. I found that adding game elements to learning does make students participate often and finish tasks more frequently. Whether it helps them think more deeply or want to learn for fun depends on how well it is designed. Their review talks about two risks. First things like leaderboards can make learners feel bad if they are always at the bottom especially those who already doubt their own abilities. This can be really discouraging for them. The ILMP tries to solve these problems by focusing on gamification that's about getting better not just competing with others. They do this in a way: Badges that show you have reached skill levels, Experience points that show how effort you have put in, Progress charts that are tailored to your learning journey This approach is different, from just using leaderboards and rewards. It makes sure that learners are motivated by their progress not just by what others think. The ILMP wants to make sure learners are motivated to learn because they want to not for a reward. The main goal is to help learners stay interested and motivated. The ILMPs approach focuses on the learners progress and achievements.

5. Learning Analytics and Data-Driven Intervention

Learning analytics is about looking at information about people who are learning. The situation they are in. This is done by collecting data and then looking at it carefully. The goal of learning analytics is to understand how people learn and to make learning. Learning analytics involves measuring, collecting and analyzing data about learners and their contexts and then using this information to understand and improve learning, which's what learning analytics is all, about. Siemens and Baker [5] Let us put learning analytics in the picture of educational data mining. We need to make sure that people from these two groups talk to each other so we can use the methods. Learning analytics is special because it does not just

tell us what is happening now. It can also tell us what might happen in the future and what we can do to stop problems before they start. This means learning analytics can help us anticipate when students might have trouble and suggest ways to fix the issues before they become problems. We need to use learning analytics to look at what might happen and to suggest ways to make things better. The goal of learning analytics is to help us understand what students are doing and how we can help them. By looking at data and talking to people from educational data mining we can make learning analytics and use it to make a real difference, in education.

Arnold and Pistilli [7] offer an example of how this can work in real life by talking about the Course Signals system at Purdue University. Course Signals used a computer program that looked at things like where students came from how they did in school before and how much effort they put in. Like how often they logged in to the learning platform and how on time they were with their assignments. It then gave each student a kind of warning sign like a traffic light that both the student and their teacher could see. This system actually helped students stay in their courses and do better in their grades. The ILMP's analytics dashboard and early-warning subsystem use this idea but with even more information, from the platform's fun and teamwork features.

III. PROPOSED PLATFORM ARCHITECTURE

1. Architectural Philosophy

The ILMP is made to be a system that's easy to use and is on the cloud. It is made up of small parts like content delivery, gamification, collaboration and analytics. Each part of the ILMP works on its own. Can talk to the other parts using a standard way of communicating. This way of building the ILMP is good for two reasons. It lets us make each part of the ILMP smaller as we need to without having to change the whole system. It also lets schools use the ILMP a bit at a time turning on each part when they are ready which is good for the ILMP and, for the schools. All learner interactions across every subsystem are logged to a centralized event store that feeds the Analytics Engine in near real-time. This ensures that the adaptive content module, the gamification module, and the analytics dashboard all operate from a shared, continuously updated representation of each learner's activity. Coherence across modules is therefore a structural property of the architecture rather than a post-hoc aggregation challenge.

2. Adaptive Content Delivery Module

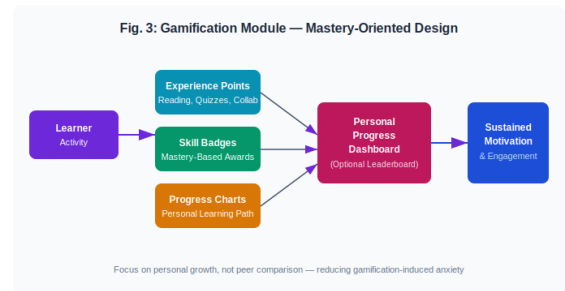
The Adaptive Content Delivery Module makes a list for each student. This list shows what the student is good at and what they need to work on. It does this by looking at how the student did on tests how long they spent on each task what they did with the learning material and how sure they felt about what they learned.

The system also looks at how other students did, in the past. Uses that information to give the student a list of things to learn next. This list is special because it is made for that student. It helps them learn what they need to know. The Adaptive Content Delivery Module does this by using a kind of computer program that helps find the best things for the student to learn. The Adaptive Content Delivery Module is always trying to help the student learn and get better. [3, 6].

The things we learn from are marked with information about how hard they're what we need to know already and how they are presented. Like text or video or a simulation or a quiz we can do. The system picks the things that're just right for us, not too hard and not too easy. If we are not doing well with things that're just text the system will send us to things that are like videos or simulations that teach the same thing. This helps us learn in a way that's good for us. The system has lots of things we can learn from. They all have information about how hard they are and what we need to know already and how they are presented. Like text or video or a simulation or a quiz we can do. The system picks the things that're just right for us, not too hard and not too easy. If we are not doing well with things that're just text the system will send us to things that are like videos or simulations that teach the same thing and this helps us learn in a way that is good, for us. recommended by Shute and Towle [6].

3. Gamification Module

The Gamification Module operationalizes the design principles identified by Dichev and Dicheva [4] We focus on helping people get really good at things. To do this we give out badges when people reach levels of skill. It does not matter how they compare to others. Everyone has a chance to get these badges. We also give experience points for doing all sorts of things like reading taking tests talking to others and giving feedback. This way people get rewarded for keeping at it not for doing well on one test. Experience points add up over time so people get credit for all their work. By doing things this way we make sure people get recognition, for their mastery not how they do compared to others. We focus on helping people get really good at things. To do this we give out badges when people reach levels of skill. It does not matter how they compare to others. Everyone has a chance to get these badges.



We also give experience points for doing all sorts of things like reading taking tests talking to others and giving feedback. This way people get rewarded for keeping at it not for doing well on one test. Experience points add up over time so people get credit for all their work. By doing things this way we make sure people get recognition, for their mastery not how they do compared to others.

A personal progress dashboard shows each learner how they are doing on their learning path. It shows what they have learned and what they have achieved. There is also a leaderboard that shows how the whole group is doing. This is not something that everyone has to see. Each learner can choose to look at it or not depending on what they want. This helps because some people get discouraged when they have to compare themselves to others all the time. The personal progress dashboard and the leaderboard are about the learning pathway and the competencies and milestones that the learners are working on. The learners can see their progress; on the learning pathway and the competencies they have mastered and the milestones they have reached.[4].

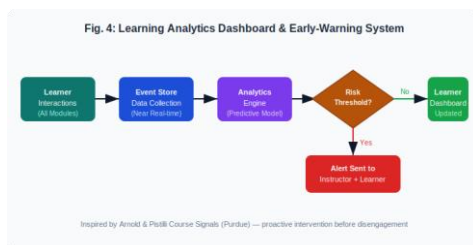
4. Collaborative Learning Subsystem

The collaborative subsystem uses the Community of Inquiry framework to make sure everything works well [2]. We have a discussion forum where people can reply to each other and vote for the comments. This helps people talk about the course material even when they are not online at the time. When students write assignments their peers can give them feedback using a template. This template helps the peers give comments that are based on how well the student did. Students can work on projects together in a space. This space has tools, like shared documents, task lists and a history of changes. These tools help students work together and keep track of what they're doing. The virtual classroom is connected to the system that looks at how students doing. It looks at things like how students are talking to each other if they are turning in their peer reviews on time and if they are showing up to the virtual classroom. All of these things are like signals that the system uses to figure out if a student is having trouble. The instructor can see all of this

information in a dashboard. The virtual. The system that looks at how students are doing work well together to help the instructor know what is going on with the students. The virtual classroom is really important, for student engagement.

5. Learning Analytics Dashboard and Early-Warning System

The Analytics Dashboard takes the information from the event store. Turns it into simple charts and graphs that two groups of people can understand. Instructors get to see the picture and also individual details about how often people log in how much of the content they complete how they do on tests how much they participate in discussions and how much time they spend on tasks. The Analytics Dashboard and its visualisations help people find trends for the group and also spot learners who are different from the others and the Analytics Dashboard does this without needing the instructors to be experts, at analysing data. Learners get a view that shows how they are doing. It displays their progress in terms of competency, it also shows how they compare to others in their group. Their identity is kept private; they receive study recommendations generated by a computer. The system also keeps an eye on each learner's progress, it checks if they are engaging with the course as expected, this is done by comparing their progress to a model that predicts how learners usually do, this predictive model is based on data from learners. This subsystem is similar, to something called Course Signals. Learners and their competency progress are the focus. Learners get study recommendations to help them improve their competency. The system helps learners by giving them a view of their competency progress. approach of Arnold and Pistilli [7]. When a learner's pattern falls below a risk threshold the system sends a message to the instructor who's in charge of that learner. The system also sends a message to the learner. This helps the instructor to get in touch with the learner and help them before they completely stop participating in the learning process. The system does this so that the learner does not get left behind. The instructor can help the learner when they need it. The learner gets a message from the system to let them know that someone is there to help them. The instructor gets a message from the system, about the learner so they can talk to the learner and figure out what is going on with the learner.



IV. DISCUSSION

1. Synergistic Integration as a Design Principle

The ILMP is special because it brings everything together. Each part of the system helps the other parts work better. The adaptive content delivery system gets information from the gamification module about how people're interacting with it. The gamification module uses information from the module to figure out when someone has learned something new. The collaborative activity system sends information to the analytics engine. Then the analytics engine helps instructors decide what to do and they use the collaborative tools to do it. This means that the ILMP as a whole is more powerful than each of its parts. The ILMP is, about working together not just putting different things side by side. Consistent with Dziuban et al.'s [1] The argument is that when we use technology to enhance learning environments that combine things it creates new and better ways for people to learn. This is not about taking the old ways of learning and putting them on a computer. The idea is that enriched blended environments can actually create new learning conditions that are different from what we had before. These enriched blended environments are not just copying what we already have they are making something new. The use of technology, in environments is what makes the learning conditions new and better.

2. Implementation Considerations

The ILMP needs to be set up and this means paying attention to things other than just the technical side of things. The people teaching is very important: the analytics dashboard is only helpful if the instructors can understand what it is saying and use that information to teach. So, when the platform is being introduced there should be training programs for the instructors to help them learn how to use the information from the ILMP. This way they can use the information to help students who are struggling and make their teaching better. The ILMP needs to be set up and this means paying attention to things other than just the technical side of things. The people teaching is very important: the analytics dashboard is only helpful if the instructors can understand what it is saying and use that information to teach. So, when the platform is being introduced there should be training programs, for the instructors to help them learn how to use the information from the ILMP. This way they can use the information to help students who are struggling and make their teaching better. [2].

Learner data privacy is something we really need to think about. We have to make sure we are taking care of it. The way we log events makes our analytics engine very strong. It also creates detailed records of what learners do. We need to make rules about how we collect, store and use these records. We

have to be open, about what we're doing. The people who make the rules have to make sure we are following the laws that protect data. We have built some safety measures into the ILMP design. For example, only certain people can get to the information. We only collect what we really need. The institutions that use the ILMP have to make sure they are following all the rules too. They have to put the platform into a system that keeps everything safe. Learner data privacy is very important. Institutions have to take care of it.

The risk of gamification-induced anxiety among lower-performing learners, documented by Dichev and Dicheva [4], this is something that people who are in charge of the platform need to think about all the time. The leaderboard that is not required does help a bit with this problem but the people who run the platform should keep an eye on how users are interacting with the platform to see if some users are quitting more often because of the game like features and be ready to change the default settings if they need to. The platform administrators should watch the engagement data, for the platform to see if there are any patterns of users dropping out that are related to the gamification features of the platform.

3. Limitations and Future Directions

This paper is about ideas. The ILMP framework is based on what we know from research but it has not been tested in a real-world setting. The ideas I am talking about here are things that need to be tested not things that we should just start doing. We need to try out the ILMP framework in a school or college and see how it works. We should do studies to see how it affects how much students want to learn how well they do in school and how happy they are with the system. We should do this in types of schools and with students, from different backgrounds to see if it really works. The ILMP framework needs to be tested in life to see if it is any good. Longer-term sustainability is still a question. Adaptive algorithms need to be updated all the time because learner groups change and content libraries grow. Gamification tools that work well at first may lose their impact as learners get used to them. The ILMP should have ways to spot when learners are getting bored and refresh the elements. This is an area where artificial intelligence can help a lot by making the learning experience more personal and engaging. The ILMP should use AI to adjust not the content but also how it makes learners feel. Longer-term sustainability and ILMP are key, to making this happen.

V. CONCLUSION

This paper is about creating a kind of learning platform. The Interactive Learning Management Platform is made to help students stay engaged in their school work. A lot of students get

bored, with the online learning systems used in colleges and universities. The new platform is designed to combine ways of teaching. This means it will have some classes in person and some online. The goal of the Interactive Learning Management Platform is to make learning more interesting and fun for students. [1], adaptive content personalization [3, 6], mastery-oriented gamification [4], collaborative learning tools [2], and a learning-analytics dashboard with early-warning capabilities [5, 7] into a unified microservices architecture, the ILMP creates the conditions for behavioral, cognitive, and emotional engagement to develop in concert rather than in isolation.

The design of this thing is based on research that has been checked by people. This makes sure that all the parts work together to make something really good. Now we need to try it out in schools and see how it works with different types of students, subjects and places. We need to get proof that this way of designing learning systems actually works. This proof will help us make sure that we are doing the best we can for students, in education. The ILMP is a part of this and we need to test the ILMP in real life.

Acknowledgment

The people who wrote this want to say thank you to the teachers and students at Nagpur University for helping them with their work, on technology. They did not get any money from outside to do this work.

REFERENCES

1. C. Dziuban, C. R. Graham, P. D. Moskal, A. Norberg, and N. Sicilia, "Blended learning: The new normal and emerging technologies," *Int. J. Educ. Technol. Higher Educ.*, vol. 15, no. 3, pp. 1–16, 2018. [Online]. Available: <https://doi.org/10.1186/s41239-017-0087-5>
2. D. R. Garrison, T. Anderson, and W. Archer, "Critical inquiry in a text-based environment: Computer conferencing in higher education," *Internet Higher Educ.*, vol. 2, no. 2–3, pp. 87–105, 1999. [Online]. Available: [https://doi.org/10.1016/S1096-7516\(00\)00016-6](https://doi.org/10.1016/S1096-7516(00)00016-6)
3. M. Vandewaetere, P. Desmet, and G. Clarebout, "The contribution of learner characteristics in the development of computer-based adaptive learning environments," *Comput. Human Behav.*, vol. 27, no. 1, pp. 118–130, 2011. [Online]. Available: <https://doi.org/10.1016/j.chb.2011.03.005>
4. C. Dichev and D. Dicheva, "Gamifying education: What is known, what is believed and what remains uncertain?" *Int. J. Educ. Technol. Higher Educ.*, vol. 14, no. 9, pp. 1–18, 2017. [Online]. Available: <https://doi.org/10.1186/s41239-017-0042-5>

5. G. Siemens and R. Baker, "Learning analytics and educational data mining: Towards communication and collaboration," in Proc. 2nd Int. Conf. Learn. Anal. Knowl. (LAK), Vancouver, BC, Canada, 2012, pp. 252–254. [Online]. Available: <https://doi.org/10.1145/2330601.2330661>
6. V. J. Shute and S. Towle, "Adaptive e-learning," *Educ. Psychol.*, vol. 38, no. 2, pp. 105–114, 2003. [Online]. Available: https://doi.org/10.1207/S15326985EP3802_5
7. K. Arnold and M. Pistilli, "Course signals at Purdue: Using learning analytics to increase student success," in Proc. 2nd Int. Conf. Learn. Anal. Knowl. (LAK), Vancouver, BC, Canada, 2012, pp. 267–270. [Online]. Available: <https://doi.org/10.1145/2330601.2330666>