Learning Management Systems in Flexible Learning Environments - A Study of Teachers' Experiences

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Abstract. Digital transformation in education is expected to progress teaching and learning. To meet this expectation, new types of classrooms called flexible learning environments are designed where digital resources such as learning management systems (LMS) are integrated. This raises the question of how LMS are experienced by teachers in flexible learning environments and how their teaching practice and competence development is supported by the LMS. In this study, ten teachers working in flexible working environments have been interviewed about their experiences with LMS. The study resulted in four themes of experiences (1) Lack of adoption, (2) Control within the system, (3) Collaboration and competence development, (4) Direct feedback and interactions. The insights of the study contributes with implications for choosing and integrating LMS in flexible learning environments.

Keywords: Learning Management System · User Experience · Flexible Learning Environments · Digital Competence

1 Introduction

The Swedish National Agency for Education states that to increase the quality of education, schools need to put emphasis on digitalization (Skolverket, 2022). In Sweden, students in lower and middle school have access to a wide arrangement of digital resources. Schools, in turn, implement LMS and flexible learning environments to support teachers' daily operations and facilitate learning. This transformation challenges teachers and educational design, i.e., how to efficiently use digital resources. Recently, digital resources and physical resources (classrooms, furniture, etc.) have been combined into flexible learning environments where teaching resources are movable and arranged to support teachers, students' needs and innovative teaching (Neill & Etheridge 2008). Research shows (see e.g. Kariippanon et al., 2018) that flexible learning environments give students more control over their learning, promote student-centered pedagogy, allow for better interactions, and that pupils students find such environments comfortable.

Digitalization within education has faced different challenges over time. Early digitalization initiatives often suffered from complicated user-interfaces, while today's

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school leaders and teachers struggle with how best to implement digital resources to support their teaching (Engen, 2019). To put it short, educational institutions can have a hard time implementing digital resources that substantially supports teaching (see e.g. Rasheed et al., 2020). In addition, there is a societal demand onto teachers to be digitally competent and find innovative ways of implementing technology in teaching and learning (Instefjord & Munthe, 2017). One example of the latter is the integration of LMS and flexible learning environments. In Sweden, teachers are often obliged to use a LMS to administrate teaching, distribute information, support pupils and learning activities, etc. Teachers are the main contributors of material on a LMS. They adapt the systems to their teaching to help students understand and achieve their course objectives. The integration of LMS and flexible learning environments inevitably forms a complex learning environment that has not previously been studied.

According to Gudmundsdottir and Hatlevik (2018) newly graduated teachers have mixed experiences with digital resources in teaching. The authors also note the importance of unveiling and understanding negative aspects of digitalization and teachers' experiences. Previous research (see e.g. Al-Fudail & Mellar, 2008) show that when implementing digital resources, stress may occur as a result of a disconnect between the environment and the teacher's skills of using the technology. This raises the question of how teachers experience LMS in flexible learning environments? This paper examines that question to better understand teachers' daily operations in such environments. The aim is to provide insights of value when choosing and integrating LMS in flexible learning environments.

In this study, data was collected from 10 interviews with teachers and analyzed with a thematic analysis which resulted in four themes of experiences (1) Lack of adoption, (2) Control within the system, (3) Collaboration and competence development, (4) Direct feedback and interactions. The insights from the study are presented as four implications when choosing an LMS to be integrated in a flexible learning environment.

2 Related Literature

The literature search was done to investigate previous research to provide an overview of related research. The literature search was based on a systematic search approach (see e.g. Webster & Watson 2002). This resulted in a systematic search that included backwards searching in relevant articles. The search ended when no new concepts were identified. A review of literature is often ready when the articles do not present any new concepts (Webster & Watson 2002). The searches were done in databases such as Scopus and Google scholar. The point of departure for the search words were inspired from the research question itself. The search words that were used included for example: "Flexible learning environments", "Digital learning platforms", "Learning management system", "Digital competence". The search words were used in combination with each other. This resulted in articles about LMS, Schools using technology within flexible learning environments and digital competence development. Additionally, literature was identified to highlight challenges with implementation of technology in teaching. The result is an overview of previous research that served as guidance for the interviews.

The related literature concerns three areas of relevance for this study; The flexible learning environment, learning management systems and digital competence. The literature section also covers challenges related to integrating learning management systems in flexible learning environments.

2.1 The Flexible Learning Environment

Classrooms are traditionally designed with a set arrangement which offers a static one-way of teaching (Neill & Etheridge 2008). Designers are now encouraged by the ministry of education to create futuristic learning environments with more dynamic features (Wells et al., 2018). In flexible learning environments the traditional set of arrangements are replaced with modifiable rooms where the furniture is no longer static (Kariippanon et al., 2018). The change of the classroom structure allows teachers to work collaboratively due to the breakout from the traditional structure (Niemi, 2021). With no frontal teaching students tend to work in smaller groups and teachers can help students with one-to-one learning (Niemi, 2021). Flexible learning environments are designed to support different learning activities facilitated by teachers, both in the physical room and in digital spaces. These activities can be simultaneous interactive. Therefore, both the physical room and the digital spaces such as LMS are open and flexible to support various types of activities. The environment is flexible in terms of being reconfigurable depending on needs. Wood (2018) argues that the concept of flexibility within a space is a cohesive connection between the space, actors and resources and people are often forgotten in the equation of what makes it flexible.

Teaching in flexible learning environments where the classroom barriers has been removed makes it visible and public for teachers to adopt strong teaching practices; moreover, this means that teachers can learn from each other and exchange materials and resources with colleagues (Niemi, 2021). In order to improve the collaboration and the way of working within these environments, educational software is frequently used to support both teaching and learning (Kariippanon et al., 2018). Students' freedom to use digital resources can sometimes result in misuse such as playing games. However, when students use digital resources as intended it allows for individualistic engagement but also collaborative work between students (Cleveland, 2018). The overlap of physical and digital resources further strengthens the abilities for students to learn from home (Cleveland, 2018). The development of technological progress allows for blended learning which uses technology to facilitate content outside of the classroom (Strayer, 2012). Blended learning is a combination of personal interactions and digital instructions (Rasheed et al., 2020). Previous research on blended learning is primarily focused on students' challenges with the online component and less attention is focused on teachers' challenges (Rasheed et al., 2020). Teachers are challenged when using technology in their teaching due to their perception and negative attitudes for using it; the educational institution on the other hand have issues distributing the correct technology to support its teachers (Rasheed et al., 2020).

2.2 Learning Management Systems

Digital resources such as LMS (learning management systems) come from a variety of stakeholders such as private actors that now show an interest in the monetizable value of digital educational resources (Godhe & Hashemi, 2019; Player-Koro et al., 2018). The implementation of LMS can result in outside actors impacting the curriculum and get partial influence on how the school is to be digitized (Godhe & Hashemi, 2019). Private digital services that are used within a governmental setting leads to schools and state education authorities having problems regulating them (Player-Koro et al., 2018). Big tech companies now provide LMS solutions for schools. These providers offer their services with the selling point that they want what's best for the education system; however, even if the use of these services is free, the teachers and students pay with their data and activity from the service (Godhe & Hashemi, 2019). Companies are taking advantage of education technology now being commodified and utilize it for profit-gains (Player-Koro et al., 2018). There might be a presence of stress associated with integration of digital resources within a classroom, the reasoning being a disconnect between the environment and the teachers' individual skill using the digital resources (Al-Fudail & Mellar, 2008). Workload created by technology can be another way of how technostress occurs (Ayyagari et al., 2011). Teachers require digital confidence when using digital resources in order to be a good role model for its students (Krumsvik, 2008). Ertmer and Ottenbreit-Leftwich (2010) explain that one of the most efficient ways for teachers to increase their confidence is by allowing them to have their own successful personal experiences with the technology.

2.3 Digital Competence

Concepts to describe digital skills and abilities can vary depending on geographic positioning (Skolverket, 2019). However, Skolverket (2019) explains that the Swedish curriculum is now adjusted to only use the concept of "Digital Competence". Spante et al. (2018) explain that when digital competence is used in publications it orients towards technology used in a professional setting with an underlying political intent. Skolverket (2019) further pose four points that are included in the definition of digital competence in the context of education.

1. Understanding the social impact of digitalization
2. An understanding of digital resources and the usage of them
3. A critical approach to technology
4. Creatively solve problems with digital resources

Digitalization creates a societal demand on teachers to be digitally competent; and further requires them to create new ways of implementing technology within the classroom (Instefjord & Munthe, 2017). Engen (2019) explains professional digital competence as adapting skills with digital resources to specific situations and being able to apply it to different subjects. Educators of teachers wield responsibility in the form of possessing the skills to use digital resources in their teaching, but they should also help teachers develop their professional digital competence (Instefjord & Munthe, 2017).

There is an expectation that professional teachers will possess digital skills that are adaptable within teaching to help the students with their development of digital competence (Engen, 2019). One argument for why newly graduated teachers are not ready for using digital resources within their teaching is the lack of preparation in their teacher training (Gudmundsdottir & Hatlevik, 2018; Fernández-Cruz & Fernández-Díaz, 2016). Newly graduated teachers' experiences with digital resources in teaching varies, and there is call for future research to understand why teachers develop negative feelings towards such implementation (Gudmundsdottir & Hatlevik, 2018). According to Godhe and Hashemi (2019) there are no explicit guidelines on what teacher students' digital competence should involve due to decision making on a local level.

From this literature overview we summarize the challenges of integrating LMS in flexible learning environments in Table 1.

Table 1. Summary of challenges from the literature section.

Identified challenges	Authors
1. Teacher's attitude and the implementation of the correct technology	Rasheed et al., 2020
2. People are often forgotten in the equation of flexible environments	Wood, 2018
3. Implementation of LMS can result in outside actors impacting the curriculum	Godhe & Hashemi, 2019
4. Stress when there is a disconnect between the environment and the teachers' skills with digital resources	Al-Fudail & Mellar, 2008
5. Digitalization creates a societal demand on teachers to be digitally competent. (And this requires them to create new ways of implementing technology within the classroom)	Instefjord & Munthe, 2017
6. Workload by technology can create stress	Ayyagari et al., 2011

3 Method

This study was conducted in the context of a research project in Sweden named Digi-FLEX. The aim of the project is to study how flexible learning environments and digital frameworks affect teaching and learning. This study was conducted in the context of this project and the teachers informing this study are active in flexible learning environments related to this project.

This study is a qualitative interview study (see e.g. Rienecker & Jørgensen, 2018) with teachers engaged in flexible learning environments. The data collection is based on semi structured interviews. The interviews captured teacher's experiences of using LMS in flexible learning environments. The literature study guided the data collection, and the material was analyzed with a thematic analysis approach (see e.g. Brown & Clarke 2006). The data collection and analysis were done by the first author under guidance by the second and third author.

3.1 Interviews

Semi structured interviews were conducted to collect data from teachers using LMS in their teaching practice in order to capture their experiences with working in lower and middle schools with flexible learning environments. The selection criteria for the teachers in the interview study were that they:

- use any type of LMS in their teaching (e.g. Google Classroom or Loops).
- work within a flexible learning environment.
- teach in lower or middle school.

The selection resulted in 10 teachers from three different schools (see Table 2).

Table 2. Overview of participants in the study.

Participant ID	Gender	Age	School ID	Length of interview
T1	Male	34	A	54 min
T2	Female	40	A	37 min
T3	Male	37	A	44 min
T4	Female	29	B	40 min
T5	Female	54	B	38 min
T6	Female	46	C	56 min
T7	Female	52	C	45 min
T8	Female	42	C	41 min
T9	Female	37	C	49 min
T10	Female	45	C	46 min

The teachers were between 29 and 54, and there were eight female and two male teachers. The length of the interviews varied between 37 and 54 min. All interviews were conducted online and recorded with Zoom. The reason for doing online interviews were for the interviews taking place at schools all over Sweden. This allowed not to be limited to a geographic position. The interview questions concerned the experiences of the teachers relating to the areas and topics in the literature (see Sect. 2). To keep the conversation on track and to cover the same topics between interviews, an interview guide was used. However, relevant follow-up questions were formulated in situ. All interviews were transcribed.

The teachers worked at three different flexible learning environments and the LMS differed between the schools. Only Google Classroom was mentioned by all teachers as a system that they used. Table 3 shows which school uses what LMS.

Table 3. More information about the schools and LMS in the study.

School ID	Description	LMS
A	A school with a flexible learning environment in Göteborg	Loops Education Binogi Google Classroom
B	A school with a flexible learning environment Ängelholm	Fronter Google Classroom
C	A school with a flexible learning environment in Lidköping	PING PONG Google Classroom

3.2 Data Analysis

The data analysis was an inductive thematic analysis and followed the process as described by Braun and Clarke (2006).

1. **Transcribing:** To interpret the interviews, they were transcribed by ear to get familiar with the material. The symbol (*) was used when noticing something that happened during the interview. This allowed for marking the underlying tone of the conversation when revisiting the transcriptions later *(e.g. *laughter or *imitating the person referenced).* By marking expressions of emotions with an asterisk, it created a nuance in the data that was helpful for the later stages of the analysis.
2. **Coding:** The coding process of the transcriptions had an overlap with the previous step. During the transcription, notes were taken in the corner of the document to highlight quotes that were deemed to be interesting for the study or when recurring statements were present in the dialog *(e.g. T3 is expressing similar concerns as T2).* Braun and Clarke (2006) state the importance of being immersed in the data, and during the first phase only to make notes that will be returned to at the later phases. When revisiting the text of the transcription it was helpful to have some notes that were written during the transcription phase. To streamline the process, Miro was used as a tool to write digital sticky notes. The sticky notes made it possible to get an overview of the data and helped the process to find resembling experiences. Each sticky note contained the following: participant ID, a quote from the participant, and a code of an experience associated with the quote. The sticky notes were assigned with a specific color depending on participant ID to keep track of the different participants when the sticky notes were placed in different themes.
3. **Identifying themes:** With all codes now on sticky notes, they were organized after loose themes that were interpreted from the codes. Finally, the codes were represented in four themes of teachers' experiences with LMS in flexible learning environments
4. **Reviewing themes:** The themes were reviewed, and the data associated with each theme was revisited to considered whether the data supported the theme, and if the themes were relevant considering the whole data material.
5. **Finalizing the themes for the study:** The outcome of the analysis was four themes of experiences that are used for the study. (1) Lack of adoption, (2) Control within

the system, (3) Collaboration and competence development, (4) Direct feedback and interactions (see Table 4).

Table 4. Examples of codes organized into the themes.

Themes	Codes
Lack of adaption	Lack of inspiration LMS designed for higher education Mobile versions are limited The LMS are not designed with the Swedish curriculum in mind
Control within the system	Lack of control Limitations of system Guardian Control LMS collects material Network issues
Collaboration and competence development	Importance of Colleagues/collaboration Learn by mistakes Many learning management systems LMS enables distance teaching The environment is well thought out
Direct feedback and interaction	Direct feedback Constant access to documents No need for uploading files Freedom with responsibility

3.3 Ethical Considerations

The participating teachers as well as the name of the schools are anonymized by changing or not including information that ties the participant to a specific school. In order to clarify the purpose and confidentiality for the teachers in interviews the following measures were taken in line with the requirements by the Swedish Research Council (2002):

- All were informed about the purpose of the study prior to the interview
- Consent was acquired from each teacher
- All material is treated with confidentiality

All interviews were conducted and transcribed from Swedish. For the findings section the quotes are translated to English.

4 Empirical Findings

The thematic analysis resulted in four themes of teachers' experiences with the LMS in flexible learning environments (1) Lack of adoption, (2) Control within the system, (3) Collaboration and competence development, (4) Direct feedback and interactions.

4.1 Theme: Lack of Adaption

The first theme concerns that the LMS not being adapted to the way the teachers prefer to work in the flexible learning environment. Some teachers mentioned their experiences with the LMS not being aesthetically pleasing or enabling the creativity that the teachers express that they would prefer, as exemplified with the following quotes.

> *Other services can be very nice for presentations. If you do presentations on the LMS, it is not as professional as a tool.* (T7)
>
> *We thought it was boring and not so inspiring. In the old LMS there were no pictures, boring and small text and boring information, and a bit confusing.* (T5)

One teacher mentioned that there were restrictions in using other platforms to upload video clips and that they were obliged to use the LMS that the school had implemented. The participant expressed this as an issue due the restrictions on the LMS.

> *We used YouTube to upload ...Tango can't have longer audio clips or movie clips if it is too large. We have just received guidelines from the municipality not using YouTube because it is external, and we have no agreement with them. It affects my teaching a lot.* (T10)

Some teachers mentioned that even though one LMS is easier to use, it still lacks the creativity that the teacher expressed that they wanted.

> *Google Classroom is easier to use than Tango... so I can say *laughs* it's more user friendly. What we miss sometimes is that it's not quite as creative.* (T6)
>
> *The thing that is boring with Google is that it is not aesthetically very multimodal. These functions that I want to work with which are in example keynote where I want to connect audio and video. It does not work in Google because it is a cloud service.* (T9)

Three of the teachers expressed an issue with the LMS not being suited for lower and middle school education. T2 gave an example of how students can download applications to their devices; However, there were no limits within that platform allowing students in the lower classes to download applications that are suited for an older demographic.

> *It is adapted to preschool all the way to high school, so there is YouTube. Something that you use a lot in older classrooms, so there maybe should be a limit. As some apps should lock depending on which year you go to.* (T2)

This mismatch of the demographic was also mentioned by teachers 10 and 4 where they expressed that some LMS were used in higher education.

This LMS is also used during university education, I do not know about the target group or if the platform is used outside of teaching. (T10)

Then it may be that it fits in higher education, that when you submit, you are done as well. (T4)

T6 and T10 mentioned that there is a mobile version of one of the LMS. However, it lacks some of the features that the web version offers.

It has almost all functions but not really all, so, it works in a way. Then we have a web version that has all functions. I cannot see assessment matrices via the app. (T6)

It's a bit messy. There is an app that also belongs to the LMS. So, there is both a web version and app. They look so different, and sometimes the app messes up and then you must go out in the web version instead. It's a little unclear. (T10)

T1 explained that functions for grading and scoring were present in the LMS, however expresses the mismatch with how the grading system is implemented in connection to the Swedish curriculum.

There are functionalities for grading and scoring, but it is according to a very American standard, and it is not made according to a Swedish curriculum connection (…) It's less based on the needs I have and more based on what they think globally about the school world. (T1)

T7 however had a different experience due to the LMS that she used had the connection to the Swedish curriculum. As the school is in a transition to a new LMS she did not know if the new LMS had the same connection.

It is adapted to the Swedish curriculum because the assessment requirements are there so everything is ready. But now we will change the LMS, and I do not know what it looks like. (T7)

T10 expressed that there was no option to change the names of certain categories in the user interface. This made T10 adapt to the limitations that the LMS have.

*Some of the functions that are in the LMS we may not use in school; we may want to call it something else, so it suits our business better. We have for example a function called discuss and the function itself suitable to upload our protocols from meetings. But it is not so logical to upload protocols to something that is called discuss *laughs* so it is something we have learned over the years that this is how we do it.* (T10)

4.2 Theme: Control Within the System

Three of the teachers mentioned that within the LMS students were given privileges that allowed them to delete assignments from the LMS. T4 and T10 mentioned that they knew how to restore assignments if they were removed. However, T2 was not aware that there was a way to restore the deleted material.

I have students who have figured out that if I have added a task they should do, and they think the task is boring for some reason. Then they can delete it and say that they have not received it. (T2)

The students can actually delete assigned documents. But if you are a little technical you know that the document is still on the drive and then you can look it up, it is very stupid, it is a disadvantage. (T4)

I had a student today who claimed that the answers had disappeared from the homework. Then I just said you know I can go back and see the history of what was in the document? Then the student said okay. I did not do it. (T10)

Three teachers mentioned that parents have an account on one of the LMS. However, when teachers use Google Classroom the parents need to access material from the student's credentials.

Only if they go into the students' accounts… but they have no own login. (T2)

The only thing parents do not have access to is Google Classroom. I wish they could, though. (T4)

On Google they actually do not have access to the material. No parental login when we link to Google classroom the students have to login for them. (T5)

Three teachers expressed that the LMS are used to collect course material and assignments for the students. The teachers expressed this as something helpful.

I have 150 students, so the LMS facilitates something incredible. Partly because the text and the practical work they do is collected. (T7)

I usually build the teaching on the LMS with the help of material, very cooperative structures where students can learn with the help of others. (T9)

It is a gathering place where I link to the resources. (T5)

Two teachers mentioned how some LMS serve as self-correcting systems and expressed how it helped them with workload.

It is very easy when you must correct. It takes less time to correct in the LMS compared to correct 100 paper booklets. I think it works well. (T3)

It facilitates self-correcting material so it's good. (T9)

The teachers in this study work in a highly digitalized environment where they are dependent on connection to the internet to do most of their teaching with the help of the LMS. During the interviews the participants expressed concerns with how vulnerable the situation can be when the internet connection is not working or it's in an unstable state.

We had a lesson a month ago when we were going to work and then the whole network was down in the city. And then you think, how do I do now? If you do not come up with something fast it will be chaos in the classroom. (T4)

It has been a bit difficult right now. We have had a day when the network was down and then it was a bit difficult. (T3)

I think that only having digital teaching materials is problematic. Because the internet sways from time to time. (T2)

T10 described that within a LMS there is no option to turn off spell-check which makes examinations difficult when working with language.

It is not possible to turn off the spelling there. Then I must check their knowledge of spelling in some other way. It is not possible to remove spelling as it's always activated., it's not good. (T10)

4.3 Theme: Collaboration and Competence Development

Some teachers mentioned that the LMS is used to share course material with other teachers. Their experience is that they save time by building upon already established material.

That's really good, because then not everyone needs to invent the wheel. If I have to have a sample about the Middle Ages, I take inspiration from someone else. (T4)

I collaborate with others and share material. If I have done a task, I share it so that the other class also gets the same thing. We share everything, it is fantastic that we do it. It is a strength. (T5)

It's good, then you do not have to invent new stuff every year. We have a template, so you can take inspiration based on it. On some theme days and so it's already done, and you come up with something new. You fill up in that bank. (T6)

When asked about how they learn about the LMS the majority referred to their colleagues as being the source of inspiration and support for adopting the LMS in their teaching.

We share ideas and thoughts between colleagues and help each other is my experience. (T9)

We have meetings like this where we teach each other different things. So, we have had it at school before, teach meets which are focused on teaching each other digital things. We run it with colleagues. We advise each other. It's great, there is a lot of information you get. (T8)

No one teaches us how to use Google Classroom because we only do it between coworkers. When a new coworker joins, I show how it works. (T4)

We show each other, we help each other. I started as a student assistant and then I saw how they did. When you use it a lot you know how to do it **(T3)**.

Previously we were better at having teach meets. Then we ended up in a period where teachers felt that it was a bit prestigious and performance requirement, which I think is a bit of a shame. We should not sit on our ideas ourselves and it is important that we share with us. (T9)

I learned from my mistakes, and then by talking to my colleagues. (T5)

Some teachers expressed that the reason for using a LMS is because of the colleagues.

I started working with Google Classroom as I do because I saw other colleagues work so then I thought it looked good (…) you help each other. (T3)

Everyone at school uses Google Classroom as far as I know. (T4)

It is also about an expectation that together with colleagues when we plan teaching, we also plan the choice of digital tools in the form of software and where the didactic design also includes digital choices. (T1)

Some of the teachers expressed frustration with the amount of different LMS that they used in their teaching. One of those frustrations was that they are required to upload documents to more than one LMS due to using different systems.

*Some things get weird because we have two places like, where is this located? So, you start to think, from the beginning everything was on Tango. And then when we got Google. When we finished the protocol, we will now and then post it on Tango? *laughs* it's really weird. It's actually confusing to have two similar systems.* (T7)

I think it's good if most things are gathered in one place, so you do not have so many different LMS, and learn them. We have a little on Google, and a little on Tango. And then I get confused where to be. (T6)

All our meetings, plans are being made in two places right now. The collaboration is available both on Tango and on Google because we have not decided that we will work with either or. It is the choice that exists, we must add up it in two places as there are those who do not use vise-verse LMS. It is mostly for the colleagues that you post it in two places. (T8)

The teachers expressed that the LMS used in a flexible learning environment allows for teaching that changed the barriers that schools previously had. As students are allowed to move between rooms the LMS supports the teachers to perform their teaching across rooms and even to students who are not present at school that day.

The computer allows you to sit a little anywhere, and just as if the student is sitting at home, the student can connect from home. (T5)

The students can work in different places, and we get a little idea of what is happening. That they also know that we are with them, that I get a little overview. (T8)

Google gives me an insight into how they work. But Tango does not, except that I see a result. Google supports the process in the flexible learning environment. It allows me to be like an eye over the shoulder. But not in everything. (T10)

Another way the teachers use the LMS is by adding material to the LMS before the lectures start. This allows the lecture to move beyond the classroom and into the LMS.

Before the lecture you put in the material early so the students can check if they want and get to know what they are going to do. (...) And is a help for those who are on holiday or sick or so, to follow from home. (T2)

Before the lesson I usually write, today we will go through this. Partly for those who want to check 2-3 times and for those who are at home and sick. (T3)

The flexible learning environment was described as well thought out and enabled the teachers to use the environment in combination with digital resources.

We do not have the old classic school building, here it is well thought out from the first sod. (T9)

I usually have QR codes in the classroom so they can scan if they want an instruction or so. Like, this is how you do it. It's great because I can give instructions and then they forget, they can check afterwards. (T7)

It can be a QR code If I want to refer to a certain page. (T3)

4.4 Theme: Direct Feedback and Interactions

The teachers expressed that the direct feedback that some LMS offer are of great value for them in the flexible learning environments that they teach in. Google Classroom is said to be the main system that the teachers use when they want to have real-time-feedback on their students when they work in other rooms.

I keep track with the help of Google Classroom and see their documents how they work if they are in another room. (T5)

I can go in and give comments immediately when they write, control function but also interest function. (T8)

Sometimes they sit in the square and work, and some manage it well. The pedagogue has the documents up, and we can see if it is written or if it stands still. Then you can go and look at them and ask how it is going. (T6)

Say that the students should work with a text. I have access to it all the time. How far they have come and give direct feedback. (T9)

We use certain LMS like Google where you see exactly what they have done and who has done what. Then it is usually enough to say, you know I can check? Google docs are good in the way that I can follow exactly what they write in real time. So, in that way it is fantastically good. (T10)

T10 and T9 expressed their feelings when they did not use a LMS that had the real-time feedback function.

Before we used Google, I had to follow what they wrote so they had to send it to me all the time. Periodically you could get 30 emails and then you had to download all documents on your own, read, give feedback, and send back. Now it's smoother in the way that I can connect to them, in that way I can follow their development much easier. (T10)

If it is in the other LMS then they must upload it. It creates more steps that do not allow direct feedback. (T9)

Some teachers talked about the challenges with working in flexible learning environments. The teachers explained that trust is important to allow the students to work outside the teacher's supervision.

Flexible learning environments enable us to spread out. You do not have to be in the same room. We coined the term freedom under responsibility. Meaning that you can also take responsibility to be in other rooms and work. (T8)

It demands of me as a teacher that I have control over my group in these flexible environments so that you have peace of mind and an agreement with the students. A lot is about trust. (T10)

The room is like the third educator, say I'm the first, the screen is the other. The physical environment being the third. And that's how you get all these pieces together and connect with what we do. (T9)

4.5 Final Remarks on the Empirical Findings

A potential interpretation of the teachers' experiences with the LMS is that even if they are supporting in many areas in the daily teaching, there seems to be a lack of standardization. This creates additional workload for the teachers. As some of the LMS do not seem to fulfill all the needs of the teachers; additional LMS are used to support it. In the first theme "Lack of adaptation" there were comments about the design of the LMS not being inspiring and created for a broad target group. Furthermore, LMS seem to be created for a global market and were not built with the Swedish curriculum in mind. The second theme "Control within the system" highlights the areas where the teachers express that they do not have full control of the LMS itself. The students are given privileges that create additional workload for the teachers due to removal of assignments. Additionally, as one teacher mentioned there was no option to turn off spell check in the LMS creating problems with examinations within subjects of language that the LMS is supposed to support. The area where teachers expressed that control was present was in the collection of material and direct feedback, where the participants expressed that as they work in flexible learning environments it's of great value to be able to have control and oversee the students across the school. Teachers share their experiences with the LMS among their coworkers allowing for development of skills and understanding on how to use the LMS efficiently. Our interpretation is that within a flexible learning environment, teachers prefer LMS that allow for direct feedback, and interaction with the students.

5 Discussion

The analysis resulted in four themes of experiences that teachers have from using LMS in flexible learning environment (1) Lack of adoption, (2) Control within the system, (3) Collaboration and competence development, (4) Direct feedback and interactions (Table 5).

Table 5. Summary of themes

Theme	Description
Lack of adaption	Experiences with the LMS in the flexible learning environment are generally positive, but there are also disruptions that the LMS have that make the teachers choose to use several LMS to meet their needs in the flexible learning environment
Control within the system	LMS both give and take control of how to work in the flexible learning environment
Collaboration and competence development	Digital competence development is aquired when interacting with their coworkers and using the LMS in their own teaching
Direct feedback and interactions	Within a flexible learning environment, it is preferred that the LMS supports direct and real time feedback for the students

Lack of adaption can, as shown in this study, influence how teachers work in flexible learning environments. As argued by Godhe and Hashemi (2019) the implementation of LMS can have an influence on how the schools are digitized. Teachers for example adapted not to use certain features such as grading when the Swedish Curriculum and grading system were not available in the LMS. Instead, they tend to avoid the feature altogether or use another system that had the grading system that they wanted. Extra workload due to the design of systems can cause technostress (Ayyagari et al. 2011). As shown by Al-Fudail and Mellar (2008), stress may happen when there is a misfit between the integration of technology in the classroom and the skills and needs of the teachers. As shown in this study teachers avoided features that cause stress due to a mismatch of needs; furthermore, teachers use multiple LMS due to there being a lack of features and limitations within each of them. The teachers expressed the need to tailor the us for the flexible learning environment in lower and middle school education.

Control within the system represents the importance of teachers' control within the LMS. As previous research shows, teachers' confidence increases when they have successful experiences with technology (Ertmer and Ottenbreit-Leftwich, 2010). In this study there are several examples of teacher's frustration over not being in control, and not being able to control what the students can and cannot do in the LMS. There were also positive experiences, for example of being able to control access to material.

Collaboration and competence development regards the importance and expectations of digital competence development in flexible learning environments. According to Instefjord and Munthe (2017) there is a societal demand on teachers to be digitally competent and finding new ways of implementing technology within the classroom. As Engen (2019) shows digitalization changes the teacher's role within the classroom and brings expectations of digital competence. As this study shows the LMS add value when it comes to sharing material with colleagues. In fact, the colleagues showed to be the

main source for competence development in this study. When the classroom structure is changed into flexible learning environments, it allows teachers to collaboratively work due the breakout from traditional structures (Niemi, 2021). In this study, the collaboration and fellowship between the teachers were expressed to be high and the teachers expressed an interest in learning from each other. However, some teachers expressed that too many LMS divide workflow forcing them to post protocols and resources in multiple places in order to reach all the coworkers. Wood (2018) showed that people are often forgotten of the equation in flexible environments. This adds up with the finding that the LMS still requires the teacher to upload material and use it in the teaching to fit in the flexible learning environment. Teachers often use the LMS before the lectures to upload material for students so they can prepare outside school hours. This adds up with Cleveland (2018) statement about the physical and digital resources overlap facilitates students' ability to learn from home. This study provides a picture of the LMS in the flexible learning environment as an enabler of collaboration and connection between the students and teachers; between rooms and overbridging the physical boundary when students are working from home.

The theme *Direct feedback and interactions* concerns the experiences of interacting with students in the flexible learning environment. In this study, the teachers regard direct feedback and interactions with the students to be of great value when working in a flexible learning environment. This is of importance to consider when choosing LMS for flexible learning environments. As Rasheed et al. (2020) argues, educational institutions sometimes have issues choosing the adequate technology to support its teachers. In this study the teachers seemed to identify the shortcomings of the LMS when interacting with students, and then choose to use external ones to fulfill their needs when following the student's progression and support students with feedback as well as interacting with students in real time.

6 Conclusion and Future Research

This study examined the question: "*How do teachers experience learning management systems within flexible learning environments?"* with the aim to provide insights of value when choosing LMS to be integrated flexible learning environments. If well designed and integrated the LMS can be a vital digital recourse in a flexible learning environment. However, if there is a misfit there are risks of workarounds, stress, and hindrance for teachers to work with the flexibility as intended. From this study we can conclude that teachers have experiences relating to how the LMS is adapted, to the control within the system, to collaboration and competence development, and to feedback and interaction with students. The insights gained from this study are of value when integrating LMS in flexible learning environments. These insights can inform the integration by taking the following implications into account when choosing and implementing an LMS into a flexible learning environment: Choose an LMS that.

- allows the flexibility for teachers to customize functions
- gives teachers the control and balance of what students can and cannot do
- allows for collaboration and knowledge exchange between teachers

- enables feedback and direct interaction with students

This study limited its scope to teachers working in lower and middle school education and therefore could future studies investigate how teachers in higher education experiences LMS in their teaching. The role of digital competence development towards LMS could be investigated when teachers are alone in their teaching subject to learn how they develop their digital competence towards LMS.

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