

Received Date: 21 April 2026**Accepted Date: 12 May 2026****Published Date: 1 June 2026**

Availability of online lesson plans and the loss of pedagogical autonomy among mathematics teachers in year 7 and 8 of basic education in the Democratic Republic of Congo: The case of schools in the Masina 1 secondary cluster

**Pierre OLELA NGONGO, Bienvenue ANAYEL NOWA, Lucien MUNSA METILA, MUNENKUM Ruphin,
Christopher KUBINGA MUYUMBA, Eminent BAKONGO NKOY**

1. Researchers at the Centre for Research into Mathematics Education, Kinshasa, Democratic Republic of the Congo, <https://orcid.org/0009-0000-6672-7593> , alphonsonjunior@gmail.com

Abstract

This study analyses the impact of online lesson preparation resources on the pedagogical autonomy of secondary school teachers, within the context of the digital transformation of education. The aim was to examine the relationship between access to these resources, the frequency of their use and their effects on teaching practices. A mixed-methods approach was adopted. Data were collected from 42 teachers using a questionnaire, then analysed using descriptive statistics, the chi-squared test and Spearman's correlation coefficient. A qualitative analysis of the verbatim transcripts complemented the study. The results show a statistically significant relationship between access to the worksheets and the frequency of their use ($\chi^2 = 41.95$; $df = 3$; significance level 5%). Spearman's correlation coefficient reveals a very strong positive correlation ($\rho = 0.91$), indicating that teachers with access to the worksheets use them more frequently. Furthermore, teachers mainly use these worksheets to save time. However, the qualitative analysis reveals contrasting patterns of use: some use them as a source of inspiration, thereby enhancing their autonomy, whilst others copy them directly, which may reduce it. The study highlights the dual

role of these tools. Its limitations relate to the sample size and the self-reported nature of the data. It emphasises the need to strengthen teacher training.

Keywords: Online lesson plans; Pedagogical autonomy; Mathematics teaching; Basic education; Digital education.

1. Introduction

It should be emphasised that digital technology plays a major role in the modernisation of education worldwide. Online teaching resources facilitate access to content for teachers and help to reduce disparities between schools. Digital teaching resources, particularly online lesson plans, are increasingly being used to support teachers' work, improve access to content and harmonise teaching practices (UNESCO, 2019). In some countries, these resources aim to improve the effectiveness of teaching (Tardif, 2017).

However, some research warns of the risk that over-reliance on standardised resources may hinder teachers' professional development. Perrenoud (1996) argued that lesson preparation is essential: it involves reflecting on teaching methods and the classroom context, and adapting content to pupils' needs. Replacing personal preparation with ready-made resources could therefore stifle teachers' creativity and autonomy. In

mathematics in particular, lessons are abstract, strategies vary and pupils struggle with the concepts. Brousseau (1998) emphasised the need for teachers to construct learning situations tailored to pupils' cognitive level, which requires a thorough mastery of the content. Mathematics pedagogy emphasises the need for teachers to design learning situations suited to learners' cognitive levels, which requires a personal grasp of the content and teaching approaches. In the DRC, the publication of online lesson plans for Years 7 and 8 forms part of the education reform. However, few studies have examined their concrete effects on teaching practices, particularly on pupils' autonomy. These lesson plans aim to facilitate learning and improve the quality of teaching, but teachers sometimes use them without adapting or analysing them, which leads to a dependency. Autonomy enables teachers to analyse their work, make informed choices and respond to pupils' needs. Altet (2013) described it as essential. A loss of autonomy could undermine the teaching of mathematics, which is already facing poor academic results and a high failure rate, according to the Ministry of Education (MEN, 2014).

The key question, therefore, is whether online lesson plans reduce the autonomy of mathematics teachers in the DRC. According to our hypotheses, their systematic use would reduce the amount of personal preparation required; dependence on them would reduce autonomy; and adapting them would help to develop skills more effectively than simply using them as they are.

The objectives are to analyse the impact on autonomy, examine patterns of use, assess users' level of autonomy, observe the effects on the quality of mathematics teaching, and suggest better ways of using digital resources thoughtfully.

Previous research has demonstrated the crucial importance of preparation. Perrenoud (1996) argued that competent teachers plan, adapt and regulate. Altet (2013) emphasises the role of professional reflexivity in the development of pedagogical autonomy. Tardif (2017) and UNESCO (2019) warn against the exclusive use of digital tools, which reduces teachers to mere executors. Brousseau (1998) addressed the issue of contextualised mathematical situations. However, in the DRC, few studies have focused on digital spreadsheets and autonomy; this study is therefore pioneering. Alexandre Mopondi Bendeko (2015) In his book **Didactics of Mathematics: Elements of Contextualisation of Teaching in the Democratic Republic of the Congo**, the author analyses the pedagogical foundations of mathematics teaching within the Congolese school context. The author observes that many teachers find it difficult to contextualise mathematical content and to develop learning situations tailored to pupils' real-life experiences. This situation often leads to the mechanical

replication of teaching methods. He proposes a contextualised didactic approach that encourages teachers to design their own teaching situations based on the learners' socio-cultural background. This analysis highlights the importance of teachers' pedagogical autonomy in lesson preparation. However, the book does not address the use of digital teaching resources or lesson plans available online. Roger Muhindo Binzaka (2020) focuses his study on cognitive activation practices in the teaching of mathematics in primary schools. The results reveal that teachers predominantly use teaching practices centred on repetition and memorisation, with few activities that encourage pupils to think critically. The author recommends training teachers to design complex tasks that stimulate learners' cognitive activity. This study highlights the limitations of current teaching practices but does not examine the causes linked to the use of standardised or online teaching materials. Frédéric Bola (2026): His research proposes an instructional design incorporating a traditional game for teaching arithmetic and geometric sequences. The author notes that the teaching of mathematics often remains abstract and ill-suited to pupils' cultural realities. He suggests incorporating games and contextualised activities to make learning more meaningful. This study highlights the need for pedagogical creativity among teachers. However, it does not address teachers' potential reliance on ready-made teaching sheets. CONFEMEN, PASEC Programme (2019) The report analyses the quality of education systems in several African countries, including the DRC. The findings show that teachers' subject-specific competences in mathematics remain low in many schools. The report recommends strengthening initial and in-service teacher training in order to improve the quality of teaching. This report partly explains why some teachers may resort to ready-made teaching materials. However, it does not address the impact of the availability of online teaching resources on professional autonomy. IFADEMS states that the teaching modules produced as part of this programme aim to improve teachers' teaching skills. Teachers need structured teaching tools to prepare their lessons effectively. The programme provides teaching guides and lesson plans to support teachers in planning learning activities. Although these resources are useful, their over-reliance could limit teachers' personal initiative, an issue that remains understudied.

This topic is linked to Sustainable Development Goal 4, which aims to ensure quality education for all. Teachers' competence and autonomy are essential in this regard. This study contributes to the debate on strengthening teachers' skills in order to improve achievement in mathematics in the DRC.

2. Methods

2.1. Methodological approach

This study adopts a sequential explanatory mixed-methods design, as proposed by John W. Creswell and Vicki L. Plano Clark (2018). This research employs a mixed-methods approach, combining quantitative and qualitative data, to analyse the influence of the availability of online lesson plans on the pedagogical autonomy of mathematics teachers in Years 7 and 8 of Basic Education.

This strategy provides: a measurable understanding of the phenomenon through quantitative data, and an in-depth, contextualised understanding through qualitative data.

The quantitative approach aims to identify trends and statistical relationships between the use of online lesson plans and teachers' pedagogical autonomy. The qualitative approach, meanwhile, allows for a more in-depth exploration of: lesson preparation practices; teachers' perceptions of the use of online lesson plans; and the possible consequences for their pedagogical autonomy. The study was conducted in secondary schools within the Masina I group in Kinshasa – both state and private – amongst teachers of Years 7 and 8. This group was chosen for its ease of access to online resources, the diversity of the schools, and logistical constraints.

2.2. Study population

The target population consists of all mathematics teachers in Years 7 and 8. A sample of 57 teachers, who had internet access and were in post this academic year, was selected through targeted sampling. A sub-sample of 17 teachers was selected for qualitative interviews.

Table 1: List of schools surveyed

No.	TYPE	SCHOOLS	FREQUENCY	PERCENTAGE
1	APPROVED PRIVATE SCHOOL	C.S. MODERNE JESUS CHRIST MA REFERENCE	25	78
		C.S. NODASA		
		C.S. BOUISSON ARDENT		
		C.S. LE MARCUS		
		C.S. SADISANA		
		COL. THE HAND OF THE ETERNAL		
		C.S. DE LA TSHANGU		
		C.S. EBEN EZER		
		C.S. SAINT ANDREA		
		C.S. FAMILY		
		C.S. ARK		
		C.S. LE SAVOIR		
		C.S. SAINT GABRIEL		
		C.S. SACRED HEART		
		C.S. LA GLOIRE		
		LES VISIONNAIRES SCHOOL		
		COLLEGE INTELLIGENCE		
		C.S. NOL AND LUZINGU		
		C.S. MISERICORDE		
		C.S. BARAKA		
		OKAPI SCHOOL		
		LA GLOIRE SCHOOL COMPLEX		
		DIYAVANGA SCHOOL COMPLEX		
		I.T.I. MOTEYI		
		NARVALO SCHOOL COMPLEX		
2	PUBLIC	DON BOSCO SECONDARY SCHOOL	7	22
		I.T.P Tatamana		
		BAHUMBU INSTITUTE		
		MAKAYA INSTITUTE		
		BOLINGO INSTITUTE		
		THE SALVATION ARMY		
		MY FAMILY INSTITUTE, MASINA		
	TOTAL		32	100

Source: our field surveys, 24 September – 2 November 2025

This table shows that 25 schools, or 78 per cent, are accredited private schools, whilst 7 schools, or 22 per cent, are state schools run by the Congolese government.

2.3. Data analysis

The statistical analysis process followed three main stages.

- Data preparation

The first stage involved preparing the data collected.

We carried out the following: data cleaning and coding of responses.

For example, numerical codes were assigned to certain qualitative responses: public institution = 1, private institution = 2, we also created composite variables.

For example: to measure the level of use of online lesson preparation sheets, several questions were combined, including: frequency of use of online sheets, reliance on teaching resources found on the internet, and personal lesson preparation. These variables were combined (by summation or averaging) to obtain an overall score for the use of online lesson preparation sheets.

Similarly, a score for teaching autonomy was constructed using several indicators: the ability to prepare one's own lessons, personal adaptation of teaching content, and pedagogical creativity in lesson preparation.

These scores enabled an analysis of the relationship between the use of online lesson plans and teachers' pedagogical autonomy.

2.4. Data collection methods

Several techniques were used to collect the information required for this study.

Firstly: a questionnaire survey was conducted amongst a convenience sample of 48 mathematics teachers teaching in Years 7 and 8 of Basic Education in secondary schools in the municipality of Masina I. Although this sample was non-probabilistic, it was deemed sufficient to produce relevant descriptive statistics concerning: the use of lesson preparation sheets available online, lesson preparation practices, and the level of teachers' pedagogical autonomy.

Secondly: the literature review. The literature review involved consulting scientific works, research articles, and educational and institutional documents relating to: teachers' pedagogical autonomy, the use of digital teaching resources, and the integration of technology into teaching. This approach helped to strengthen the theoretical and conceptual framework of the study.

Thirdly: open-ended interviews. This method enabled contact to be made with: heads of studies, directors of studies, and mathematics teachers.

These interviews provided in-depth information on teachers' teaching practices, in particular: how they prepare their lessons, their use of online teaching resources, and their perception of the impact of these resources on their pedagogical autonomy.

Fourth: direct observation. Direct observation in the field enabled us to closely observe: teachers' lesson preparation practices, the actual use of teaching resources, and the real teaching conditions in schools.

This observation was carried out in secondary schools in Masina I, during the period from 24 September to 2 November 2025, which corresponded to the data collection period.

2.5. Operational definition of variables

a. Independent variables

Independent variables are those that may influence teachers' pedagogical autonomy: availability of online lesson plans, access to digital teaching resources, teachers' level of proficiency in digital technologies, initial and continuing teacher training, and type of school (state or private).

b. Dependent variables

Dependent variables correspond to the observed effects: teachers' level of pedagogical autonomy, capacity for independent lesson preparation, quality of mathematics teaching, and pedagogical adaptation of content to pupils' needs.

c. Control variables

Certain variables may also influence the results: teachers' professional experience, class sizes, working conditions in schools, and the socio-educational environment of the schools.

2.6. Data processing and analysis

In this research, the data were analysed in two ways: quantitative analysis and qualitative analysis.

2.6.1. Quantitative analysis

We first used the questionnaire responses. These responses were converted into figures and tables to gain a better understanding of the situation regarding the availability of online lesson plans and the pedagogical autonomy of maths teachers.

a. Descriptive statistics

We used descriptive statistics, which means we simply described the results obtained.

For example: how many teachers use lesson plans found online, how many teachers prepare their own lessons, and how many teachers feel that using online lesson plans reduces their pedagogical autonomy.

To do this, we used:

- frequencies (the number of responses),
 - means (the average of the results),
 - standard deviations (to see whether the responses are close together or very different).
- b. Checking the relationships between certain variables

We also sought to find out whether certain things are linked.

For example: do teachers who frequently use online lesson plans lose more of their teaching autonomy?

Do teachers with more years' experience make less use of online lesson plans?

To do this, we used Spearman's correlation.

These methods enable us to check whether two variables change in tandem.

Comparison of certain situations. We also used: the chi-squared test. This test allows us to check whether two pieces of information are linked.

For example: the use of online lesson plans and teachers' level of pedagogical autonomy.

Where the number of responses was too small, we used Fisher's exact test, which is more suitable in such cases. Certain statistical methods, such as Pearson's correlation and multiple regression, were not used because the number of participants was limited (57 teachers). Researchers recommend a larger sample size for using these methods. To avoid unreliable results, we used methods more suited to a small sample.

c. Use of non-parametric methods

As the sample is relatively small (57 participants), we used non-parametric tests. These methods are more appropriate when: the sample is small, and the data do not follow a normal statistical distribution perfectly.

2.6.2. Qualitative analysis

In addition to the figures, we also analysed the teachers' comments.

This information was drawn from: interviews with teachers, observations carried out in schools, and field notes. We used a method known as thematic analysis. This method involves identifying the main ideas that recur frequently in the discussions.

The analysis followed the steps proposed by researchers Virginia Braun and Victoria Clarke (2021). The steps were as follows: the interviews were transcribed in full; we identified the key ideas in the responses; these ideas were then grouped into broad themes.

The main themes identified in this research are: the frequent use of lesson plans available online; a reduction in personal lesson preparation; reliance on teaching resources found on the internet; and the gradual loss of pedagogical autonomy amongst some teachers.

2.6.3. Unit of analysis and saturation

The unit of analysis corresponds to the teachers' discourse.

More specifically, we analyse: their explanations of how they prepare lessons, their perceptions of the use of lesson plans available online, and their views on the impact of these resources on their pedagogical autonomy. Each idea or explanation provided by a teacher therefore becomes an element of analysis.

As regards saturation, at the start of the interviews, the teachers provided a great deal of new information. However, after several interviews, we noticed that the same ideas and issues kept recurring.

At that point, further discussions no longer yielded any genuinely new information. We therefore considered that thematic saturation had been reached and ceased data collection.

2.6.4. Coding procedure and thematic analysis

During the interviews, the teachers shared their experiences and opinions. Their exact words are referred to as verbatim quotes.

To analyse these responses, we followed several simple steps: writing down all the teachers' responses, reading these responses several times to ensure we understood them fully, carrying out the coding – that is, assigning a short word or heading to each key idea – grouping together codes that referred to the same issue, identifying the main themes, and

using a few exact quotes from the teachers to illustrate the findings.

Example of coding:

A teacher stated during the interview: ‘I often download lesson plans from the internet because I don’t have enough time to prepare my lessons myself.’

Identified codes: use of online lesson plans, lack of personal preparation, reliance on internet resources.

These codes can then be grouped under a main theme: Reliance on online lesson plans and reduced teaching autonomy.

2.6.5. Integration of mixed data

Data integration followed the ‘connecting, building, then merging’ approach proposed by John W. Creswell (2015). To combine the results, we followed three stages of triangulation.

a. Connecting

We first established a link between the questionnaire results and the interviews. For example, if the questionnaires showed that many teachers use lesson plans available online, we asked the teachers to explain why they use these lesson plans and how this influences their teaching style.

b. Building

Next, we used the teachers’ responses to gain a better understanding of the figures. For example, the statistical results might show that the use of online lesson plans is very common. The teachers then explained that: they lack time to prepare lessons; they find online lesson plans easier to use; and some teachers copy lesson plans found on the internet directly. These explanations enable us to construct a better interpretation of the results.

c. Merging

Finally, we combine the quantitative and qualitative results in the final analysis. In other words, we compare: the numerical results from the questionnaires, and the explanations provided by the teachers during the interviews. This integration enables a better understanding of how the availability of online lesson plans can influence the pedagogical autonomy of maths teachers in secondary schools within the Masina I cluster.

Ethical considerations

- Several ethical principles were adhered to in the course of this research.
- Teachers’ participation was voluntary.

- Participants gave their informed consent.
- The anonymity and confidentiality of the information were guaranteed.
- The data collected were used solely for scientific purposes.

Inclusion and exclusion criteria

Inclusion criteria

To take part in the study, teachers had to: be a mathematics teacher; be currently teaching Year 7 and/or Year 8 classes in Basic Education; be working at a secondary school located in the municipality of Masina I; and voluntarily agree to take part in the study.

Exclusion criteria

The following were excluded from the study: teachers teaching exclusively at other levels, teachers of other subjects, and those who voluntarily refused to take part in the survey.

Limitations of the study: This study has certain limitations: the use of non-probability sampling, the relatively small sample size, the reliance on self-reported data from teachers, and the exploratory nature of certain analyses. These limitations suggest the need for future research using: larger probabilistic samples; and longitudinal approaches to observe how the phenomenon evolves over time.

2.7. Logistical resources

The following logistical tools were required to carry out the research: printed questionnaires, an interview guide, a voice recorder, a field notebook, pens, the internet, and school authorisations.

3. Results

3.1. Teacher identification

Table I: Breakdown of our respondents by gender.

Gender	Frequency	Percentage
Male	42	100
Female	0	0
Total	42	100

Source: field data from 24 September to 2 November 2025

This table shows that 100 per cent of the teachers surveyed are male, and no women took part in the study.

3.2. Age

Table II: Breakdown of our respondents by age group.

Age	Frequency	Percentage
Under 30	5	12
30–39 years	12	28.5
40–49	16	38
50 and over	9	21.5
Total	42	100

Source: field data from 24 September to 2 November 2025

The majority of teachers (38 per cent) are aged between 40 and 49, followed by 21 per cent aged 50 and over; only 12 per cent are under 30.

3.3. Level of education

Table III: Breakdown of our respondents by level of education.

Level of education	Frequency	Percentage
State qualification	12	28.5
Graduate	9	21.5
Bachelor's degree	21	50
Total	42	100

Source: field data from 24 September to 2 November 2025

This table shows that half of the teachers surveyed hold a Bachelor's degree, 28.5 per cent hold a state-recognised qualification and 21.5 per cent hold a graduate diploma.

3.4. Years' experience in teaching

Table IV: Breakdown of our respondents by length of service in teaching.

Years' service	Frequency	Percentage
Less than 5 years	7	16.6
5–9 years	11	26
10–14 years	15	36
15 years and over	9	21.4
Total	42	100

Source: field data from 24 September to 2 November 2025

The table above shows that 36 per cent have between 10- and 14-years' experience, 21.4 per cent have 15 years or more, and only 16.6 per cent have less than 5 years' experience.

3.5. Class taught

Table V: Breakdown of our respondents by year group taught.

Class taught	Frequency	Percentage
Year 7 EB	7	16.6
8th EB	8	19
Both at the same time	27	64.2
Total	42	100

Source: field data from 24 September to 2 November 2025

The majority (64.2 per cent) teach both Year 7 and Year⁸, 16.6 per cent teach only Year 7 due to the number of classes organised by their schools, and 19 per cent teach Year 8 for the same reason as for Year⁷.

3.6. Type of school

Table VI: Breakdown of our respondents by school management system.

Management system	Frequency	Percentage
State	15	35.7
Private	20	47.6
State-funded	7	16.6
Total	42	100

Source: field data from 24 September to 2 November 2025

The majority of teachers come from private schools (47.6 per cent). State schools account for 35.7 per cent. State-subsidised schools are in the minority (16.6 per cent).

Our sample is dominated by the private sector, which may influence the results, particularly with regard to access to digital resources and pedagogical autonomy.

3.7. Access to online maths lesson plans

Table VII: Breakdown of our respondents by access to online lesson preparation resources.

Online access	Frequency	Percentage
Yes	14	33
No	26	67
Total	42	100

Source: field data from 24 September to 2 November 2025

67 per cent of teachers do not have access to online lesson plans; only 33 per cent do. Access to digital resources remains limited. This explains the low uptake of online lesson plans in our study setting (likely due to technological constraints in the DRC).

3.8. The main method used to access the internet

Table VIII: Breakdown of our respondents by the main method used.

Method	Frequency	Percentage
Mobile phone	7	50
Computer	2	14
Sheets already printed	5	36
Total	14	100

Source: field data from 24 September to 2 November 2025

Mobile phones are the main means of access (50 per cent), whilst computers are used very little (14 per cent). Digital use is predominantly mobile. This indicates limited access to traditional IT tools, which affects the quality and frequency.

3.9. The frequency of use of online or pre-printed preparation sheets

Table IX: the breakdown of our respondents by type of guide used and frequency of use.

Frequency of use	Frequency	Percentage
Always	2	4.7
Often	8	19
Rarely	4	9.5
Never	28	66.6
Total	42	100

Source: field data from 24 September to 2 November 2025

This table shows that 66.6 per cent never use the online worksheets, whilst only 4.7 per cent always use them. The use of digital worksheets is very low. This confirms that digital technology has not yet been integrated into everyday teaching practices.

We therefore analyse the data from the 14 people who confirmed that they use online worksheets in response to the following questions.

3.10. The main reasons for using online worksheets or PDFs

Table X: Breakdown of our respondents according to the main reasons for using online worksheets or PDFs.

Reason	Frequency
Time-saving	14
Administrative requirement	0
Lack of training	0
Ease of access to example scenarios	14

Source: field data from 24 September to 2 November 2025

The two main reasons are: saving time and ease of access to examples; no teacher mentioned any administrative obligation. Use is motivated by practical and pedagogical reasons, not by institutional constraints.

3.11. Methods of using the online lesson plans.

Table XI: Breakdown of our respondents by how they use the online lesson plans.

Method of use	Frequency	Percentage
Copied directly without modification	5	35.7
Partial adaptation	2	14.2
Inspiration for creating my own fact sheet	7	50
Total	14	100

Source: field data from 24 September to 2 November 2025

Used as inspiration to prepare their own worksheet: 50 per cent; copied directly without modification: 35.7 per cent; partially adapted: 14.2 per cent. This table therefore shows that the majority (50 per cent) use the worksheets as a source

of inspiration, 35.7 per cent copy them directly, and few teachers adapt them partially.

Teachers favour a reflective approach (inspiration) rather than simply copying and pasting. This demonstrates a certain degree of pedagogical autonomy.

3.12. Do you still prepare your own lesson plans?

Table XII: Breakdown of our respondents according to the degree of autonomy in the lesson plan.

Level of autonomy of the lesson plan	Frequency	Percentage
Yes, always	7	50
Sometimes	3	21.4
Rarely	4	28.5
Never	0	0
Total	14	100

Source: field data from 24 September to 2 November 2025

Yes, always 50 per cent, sometimes 21.4 per cent, rarely 28.5 per cent, never 0 per cent; therefore, 50 per cent always prepare their own lesson plans, and no teacher relies entirely on online resources. Despite the availability of digital resources, professional autonomy remains strong. Teachers continue to play an active role in lesson planning.

3.13. Usage prior to online access

Table XIII: Breakdown of our respondents by usage prior to online access.

Usage prior to online access	Frequency	Percentage
Yes, always	14	100
Yes, often	0	00
Yes, rarely	0	00
No, never	0	00
Total	14	100

Source: field data from 24 September to 2 November 2025

This table shows that 100 per cent of teachers always prepared their own lesson plans before online lesson plans were available. No teachers relied on an external source.

Before the introduction of digital resources, teachers demonstrated complete pedagogical autonomy in planning their lessons. This shows that: The professional culture was based on personal preparation. Online lesson plans are not the basis of lesson planning, but rather a complementary tool.

3.14. The use of online lesson plans and the reduction in teachers' pedagogical autonomy

Table XIV: Breakdown of our respondents by pedagogical impact.

Pedagogical impact	Frequency	Percentage
Yes, significantly	1	7.1
Yes, to some extent	0	0
No, not at all	3	21.4
No, she increased it	10	71.4
Total	14	100

Source: field data from 24 September to 2 November 2025

71.4% believe that the online lesson plans have increased their teaching autonomy, 21.4% think this has had no negative impact, only 7.1% feel that their autonomy has been significantly reduced, and no teacher mentions a moderate reduction.

Contrary to some fears, online lesson plans do not appear to undermine teachers' autonomy. On the contrary: they are seen as a tool for professional development. They facilitate lesson preparation whilst allowing scope for personal adaptation.

3.15. The aspect of teaching practice most affected by online lesson plans

Table XV: Breakdown of our respondents by the aspect of teaching practice most affected by online lesson plans.

Teaching practice	Frequency
Creativity in lesson planning	8
Adapting to pupils' needs	10
Choice of examples and exercises	14
Assessment of learning	2
No aspect	0
Total	34

Source: field data from 24 September to 2 November 2025.

This table presents the aspects of teachers' teaching practice influenced by the use of teaching resources available online.

The results show that the choice of examples and exercises is the aspect most affected, with 14 out of 34 responses. This means that teachers often use the content provided in the online worksheets to select or adapt exercises and examples for their pupils. Digital resources therefore serve primarily as a source of teaching inspiration. Next, adapting to pupils' needs was cited in 10 responses, indicating that online worksheets can help teachers tailor their teaching content to learners' difficulties or ability levels.

Furthermore, creativity in lesson planning was mentioned by 8 respondents, suggesting that these digital resources can stimulate pedagogical innovation among some teachers, although this effect is less pronounced than for examples and exercises.

Conversely, assessment of learning was scarcely mentioned, with only two responses, meaning that teachers rarely use online worksheets to design assessment tools. Finally, no teacher stated that any aspect was unaffected, indicating that online teaching worksheets have a real influence on teaching practice.

In summary, these results show that online teaching guides primarily influence teaching content and methods, particularly in the choice of teaching activities, but they have a limited impact on assessment practices.

3.16. Use of online teaching guides to develop instructional design skills

Table XVI: Breakdown of our respondents according to their use of online teaching guides to develop instructional design skills.

Instructional design	Frequency	Percentage
Yes, as a basis for innovation	12	85.7
Yes, but only to copy	2	14.3
No, they replace my own preparation	0	0
No, I don't need them	0	0
Total	14	100

Source: field data from 24 September to 2 November 2025

This table analyses how teachers use online teaching resources to improve their instructional design skills. The results show that the vast majority of teachers (85.7 per cent, or 12 out of 14) report using these guides as a basis for innovating in their teaching practice. This means that online resources are not simply reproduced, but serve as a reference or model for developing new teaching approaches. However, 14.3 per cent of teachers (2 respondents) admit that they use these guides solely to copy the content. This practice may reflect a lack of training or proficiency in independently designing teaching materials. Furthermore, no teacher stated that online guides completely replace their lesson preparation, nor that they do not need them. This shows that these resources are generally perceived as a complement to the teacher's pedagogical work, rather than a substitute. Thus, these results suggest that online teaching resources contribute overall to the development of teaching skills, whilst highlighting the need to encourage a more creative and critical use of these resources.

3.17. Assessment of current level of teaching autonomy

Table XVII: Breakdown of our respondents by current level of teaching autonomy

Perceptions and impacts on teaching autonomy	Frequency	Percentage
Very high	10	71.5
High	2	14.2
Medium	2	14.2
Low	0	0
Very low	0	0
Total	14	100

Source: field data from 24 September to 2 November 2025

This table assesses teachers' perceptions of their level of pedagogical autonomy, on a scale ranging from 1 (very low) to 5 (very high). The results indicate that 71.5 per cent of teachers (10 out of 14) consider their pedagogical autonomy to be very high. This means that the majority of teachers feel capable of designing and adapting their teaching practices independently. Furthermore, 14.2 per cent of respondents (2 teachers) rate their autonomy as high, whilst 14.2 per cent consider it to be moderate. These results show that, although the majority perceive themselves as having a very high level of autonomy, a minority still consider their level of autonomy to be more moderate. It is also important to note that no teacher reported a low or very low level of autonomy. This suggests that the teachers surveyed generally have a high level of confidence in their professional abilities.

These results reveal that the use of online teaching resources does not appear to reduce teachers' pedagogical autonomy, but rather forms part of a framework in which they retain a strong capacity for decision-making and pedagogical design.

3.18. Training teachers to create personalised worksheets despite online access

Table XVIII: Training teachers to create personalised worksheets

Training teachers in personalised creation	Frequency	Percentage
Yes	12	85.7
No	2	14.3
Total	14	100

Source: field data from 24 September to 2 November 2025

This table presents teachers' views on the need to train teachers in the creation of personalised teaching resources, despite the availability of online resources. The results show that 85.7% of respondents (12 teachers) believe it is necessary to train teachers in the design of personalised teaching resources. This large majority highlights the importance of pedagogical training that enables teachers to develop their own teaching tools, tailored to the specific context of their pupils. Conversely, 14.3 per cent of teachers (2 respondents) believe that such training is unnecessary, probably because they consider the worksheets available online to be sufficient for their teaching needs. Overall, these results highlight a significant demand for the development of teaching skills, particularly in the design of teaching materials adapted to local circumstances.

3.19. Testing the correlation between access to online resources and frequency of use

Chi-squared test:

1. Construction of the cross-tabulation table

We have:

➤ For the 'online access' category:

- Yes = 14
- No = 28

➤ Frequency:

- Always = 2
- Often = 8
- Rarely = 4

- Never = 28

We are creating a logical table:

Access/Frequency	Always	Often	Rarely	Never	Total
Yes	2	8	4	0	14
No	0	0	0	28	28
Total	2	8	4	28	42

Practical formula $X^2 = \sum \frac{(O-E)^2}{E}$, or $X^2 = \sum \frac{(vu - \text{attendu})^2}{\text{attendu}}$

O = observed frequency

E = expected theoretical frequency

The expected frequency is calculated as:

$$E = \frac{(\text{total ligne} \times \text{total colonne})}{\text{total g n ral}}$$

- Row yes

1. Cell yes / always

$$E = \frac{14 \times 2}{42} = 0,67$$

2. Cell yes / often

$$E = \frac{14 \times 8}{42} = 2,67$$

3. Cell yes / rarely

$$E = \frac{14 \times 4}{42} = 1,33$$

4. Cell yes / never

$$E = \frac{14 \times 28}{42} = 9,33$$

- Row No

5. Cell no /always

$$E = \frac{28 \times 2}{42} = 1,33$$

6. Cell: no / often

$$E = \frac{28 \times 8}{42} = 5,33$$

7. Cell: no / rarely

$$E = \frac{28 \times 4}{42} = 2,67$$

8. Cell: no / never

$$E = \frac{28 \times 28}{42} = 18.67$$

Table XIX: Complete table

Cell	O	E	$\frac{(O - E)^2}{E}$
Yes-always	2	0.67	2.66
Yes – often	8	2.67	10.64
Yes – rarely	4	1.33	5.33
Yes – never	0	9.33	9.33
No – always	0	1.33	1.33
Not often	0	5.33	5.33
Not infrequently	0	2.67	0.202
Never	0	2.67	2.67
9	20	18.67	4.66
Total chi-squared			41.95

Degrees of freedom:

$$Df = (2-1) (4-1) = 3$$

Decision:

Table XX: Table of critical values for the chi-squared statistic (χ^2)

Degrees of freedom (df)	Critical value x2
1	3.84
2	5.99
3	7.81
4	9.49
5	11.07

6	12.59
7	14.07
8	15.51
9	16.92
10	18.31

Critical value according to the chi-squared table (ddl=3, $\alpha=0.05$)

$$\text{Calculated } \chi^2 = 41.95$$

$$41.95 > 7.81$$

Conclusion: the relationship is significant; therefore, access to the records strongly influences the frequency of use.

3.20. Spearman's test

We wish to measure the relationship between:

- Access to online fact sheets (x)
- Frequency of use (y)

Variable coding:

Variable X (access):

Type	Code
Yes	1
No	0

Variable Y (Frequency):

Modality	Code
Never	1
Rarely	2
Often	3
Always	4

Compilation of individual data:

- Group 1: access = YES (14 teachers)

Frequency	Sample size	Y value
Always	2	4
Often	8	3
Rarely	4	2

Therefore:

- 2 individuals: (1,4)
- 8 individuals: (1,3)
- 4 individuals: (1,2)
- Group 2: Access = No (28 teachers)

Frequency	Sample size	Y value
Never	28	1

So, 28 individuals: (0.1)

Table of observations:

Let's put it all together:

X	Y	Number
1	4	2
1	3	8
1	2	4
0	1	28

Total = 42

SPEARMAN's formula:

$$P = 1 - \frac{6\sum d^2}{n(n^2-1)}$$

In this case, the data are grouped, so we use a simplified method based on the mean ranks.

$$\text{Mean of } X^-: \bar{X} = \frac{14+1+28 \times 0}{42} = \frac{14}{42} = 0.33$$

$$\text{Mean of } \bar{Y}: \bar{Y} = \frac{(2+4+8 \times 3+4 \times 2+28 \times 1)}{42} = \frac{(8+24+8+28)}{42} = 1.62$$

Calculation of the numerator

$$\sum (X - \bar{X}) (Y - \bar{Y})$$

So, we will calculate line by line:

Row 1: (1.4), count = 2

$$(1 - 0.33) (4 - 1.62) = (0.67) (2.38) = 1.59$$

$$1.59 \times 2 = 3.18$$

Row 2: (1.3), number of items = 8

$$(0.67) (1.38) = 0.92$$

$$0.92 \times 8 = 7.36$$

Row 3: (1.2), number of students = 4

$$(0.67) (0.38) = 0.25$$

$$0.25 \times 4 = 1$$

Row 4: (0.1), number of students = 28

$$(-0.33) (-0.62) = 0.20$$

$$0.20 \times 28 = 5.6$$

$$\text{Sum } \sum = 3.18 + 7.36 + 1 + 5.6 = 17.14$$

Calculation of the denominator

Standard deviation of X

$$\sum (X - \bar{X})^2$$

$$\bullet (1-0.33)^2 \times 14 = 0.45 \times 14 = 6.3$$

$$\bullet (0-0.33)^2 \times 28 = 0.11 \times 28 = 3.08$$

Total sum = 9.38

Standard deviation of Y

$$\sum (Y - \bar{Y})^2$$

$$\bullet (4-1.62)^2 \times 2 = 5.66 \times 2 = 11.32$$

$$\bullet (3-1.62)^2 \times 8 = 1.90 \times 8 = 15.2$$

$$\bullet (2-1.62)^2 \times 4 = 0.14 \times 4 = 0.56$$

$$\bullet (1-1.62)^2 \times 28 = 0.38 \times 28 = 10.64$$

Total: 37.72

Final formula:

$$p = \frac{17,14}{\sqrt{9,38 \times 37,72}}$$

$$p = \frac{17,14}{\sqrt{353,77}}$$

$$p = \frac{17,14}{18,81}$$

p = approximately 0.91

Interpretation: p = 0.91; the correlation is very strong and positive.

Spearman's correlation coefficient (p = 0.91) indicates a very strong positive relationship between access to online worksheets and the frequency of their use. This means that teachers with access to digital worksheets use them much more frequently than those without access.

3.21. Qualitative analysis of verbatim comments

The qualitative analysis aims to gain an in-depth understanding of teachers' perceptions regarding the use of online lesson plans and their influence on pedagogical autonomy. It is based on comments gathered from teachers (verbatim quotes), which enable the statistical results to be interpreted and contextualised.

The analysis highlights several key themes.

3.21.1. Time savings: the main motivation

The majority of teachers interviewed cited time savings as the main reason for using the online lesson plans.

- Representative verbatim quotes:

"The online lesson plans save me time"

"I can prepare my lessons quickly thanks to the worksheets available"

"It makes my day-to-day work easier"

- Analysis:

Time savings appear to be a key factor in the adoption of digital lesson plans. In a context where teachers are often overburdened, these resources offer a practical solution to lighten the workload involved in lesson preparation. However, this convenience may lead to a reduction in the effort put into lesson planning, which could affect the quality of teaching in the long term. Thus, time-saving is both a practical advantage and a potential source of dependency.

3.21.2. Worksheets as a source of inspiration

Some teachers use online worksheets as a basis for developing their own lessons.

- Direct quotes:

"I draw inspiration from the worksheets to create my own"

"It helps me come up with ideas"

"I don't copy them, but I use them as a guide"

- Analysis:

In this case, the worksheets play a positive pedagogical role. They become a tool for informal training, enabling teachers to: enrich their teaching practices, improve lesson structure, and develop creativity.

This use reflects active autonomy, where the teacher remains in control of their work. It confirms that digital resources can be a driver of professional development.

3.21.3. Direct copying: a cause for concern

Some teachers admit to using the worksheets without making any changes.

- Direct quotes:

"I copy it directly without changing anything"

"I use the worksheet as it is"

"I don't have time to make changes"

- Analysis:

This practice demonstrates a reliance on online resources. The teacher becomes merely a follower here, which raises several issues: a failure to adapt to the classroom context, insufficient consideration of pupils' ability levels, and a reduction in pedagogical creativity. This situation can lead to a gradual loss of professional autonomy.

3.21.4. Lack of training: a structural cause

Certain comments implicitly reveal a lack of training.

- Direct quotes:

"I've never been trained to create my own worksheets"

"We use whatever we can find"

"We haven't been taught how to prepare the fact sheets properly"

- Analysis

The use of online worksheets is not merely a choice, but sometimes a necessity arising from a lack of training. This highlights a weakness in the education system and a need to strengthen teaching skills. As such, the worksheets become a

stopgap solution in the face of inadequate initial or continuing professional development.

3.21.5. Impact on teaching autonomy

Teachers' views are mixed.

- Direct quotes:

'It improves my work'

"It helps me to be more efficient"

"It reduces the amount of effort I have to put in"

"I don't have to think as much as I used to"

- Analysis:

Two main trends emerge:

- Positive effects: improved lesson planning, access to a variety of examples, and enhanced teaching skills. In this case, the worksheets increase autonomy.
- Negative effects: reliance on existing content, reduced creativity, less personal effort. Here, the worksheets reduce genuine autonomy.

3.21.6. Cross-cutting analysis

The overall analysis shows that the use of online worksheets is ambivalent.

On the one hand: a modern tool, time-saving, improved teaching practices.

On the other hand: risk of passivity, standardisation of teaching, loss of autonomy.

3.21.7. Triangulation with statistical results

The qualitative results confirm the quantitative analyses:

- The chi-squared test shows a significant relationship,
- Spearman's coefficient indicates a strong correlation
- The verbatim transcripts explain this relationship:

access → use → time savings, but also → potential dependency

In conclusion, the qualitative analysis highlights that online lesson plans are an important tool in teachers' teaching practices. However, their impact on pedagogical autonomy depends heavily on how they are used. When they serve as a source of inspiration, they strengthen teachers' skills. Conversely, when they are used passively, they can limit their autonomy and creativity. It therefore appears necessary to

enhance teacher training in order to promote a critical and pedagogical use of digital resources.

4. Discussion

4.1. Highlighting the originality of the study

This study stands out for its innovative nature in the context of mathematics teaching in Years 7 and 8 of Basic Education in the DRC, particularly in Kinshasa.

Indeed, few local studies have specifically analysed teachers' use of online lesson plans. Most African research on digital technology focuses on the use of ICT in the classroom, but rarely on prior lesson planning. Our research highlights the relationship between the digitisation of teaching resources and teachers' professional autonomy, which constitutes an original contribution to the field of mathematics education in the DRC. Thus, this study helps to empirically document a reality that remains largely unexplored in our educational context.

4.2. Link to the Sustainable Development Goals (SDGs)

The findings are directly aligned with SDG 4: Ensuring access for all to quality, inclusive and equitable education and promoting lifelong learning opportunities.

More specifically: limited access to online worksheets (33 per cent) reveals inequalities in access to digital resources; the widespread use of mobile phones as the primary means of access demonstrates an adaptation to local realities; and the positive perception of the impact of online worksheets on autonomy (71.4 per cent believe it increases autonomy) indicates that digital tools can help improve the quality of lesson preparation. Thus, strengthening digital infrastructure could lead to a significant improvement in the quality of mathematics teaching.

4.3. Validity of the results in relation to the method used

The validity of the results is based on: a descriptive quantitative approach using a structured questionnaire; a sample of 42 teachers, 14 of whom had access to online lesson plans; and the use of descriptive statistics (frequencies and percentages).

The internal consistency of the responses reinforces the credibility of the results. For example: 100 per cent of teachers stated that they used to prepare their worksheets before the advent of digital technology. No teacher reported having completely abandoned personal preparation. The majority consider that the online worksheets enhance their autonomy. These converging results support the internal validity of the study.

4.5. Limitations of the study

Although relevant, the study has certain limitations: the sample is restricted to a limited number of schools. The research is based on self-reported data (questionnaire), which may introduce subjective bias. The study is primarily descriptive and does not test in-depth statistical relationships. However, these limitations do not undermine the exploratory and diagnostic scope of the study. Rather, they open up avenues for more in-depth future research (mixed-methods approach, classroom observation, comparative study).

4.6. Explanation of the results obtained

a) Low access to online resources (33 per cent) This finding can be explained by technological constraints (internet connection, data costs), a lack of digital infrastructure in some schools, and the absence of a strong institutional policy on the digitisation of teaching.

b) Predominant use of mobile phones.

This result reflects the technological reality in the DRC: smartphones are more accessible than computers.

c) Low frequency of use (66.6 per cent ‘never’) This confirms that the integration of digital tools into lesson planning remains marginal.

d) Unexpected finding: increased autonomy (71.4 per cent) One might expect online resources to reduce autonomy through a ‘copy-and-paste’ phenomenon. However, the majority of teachers state that the worksheets serve as inspiration, enrich their teaching practices and strengthen their professional autonomy. This demonstrates a critical, rather than passive, engagement with digital resources.

4.7. Comparison with previous studies

The findings are consistent with several studies on the integration of ICT in sub-Saharan Africa, which show: limited access to digital resources (UNESCO, 2021); a heavy reliance on mobile phones rather than computers; and a gradual and cautious adoption of digital tools. However, unlike some Western studies which highlight the risk of excessive standardisation of teaching practices, our study shows that teachers retain a high degree of autonomy. Digital technology is perceived as a means of enrichment rather than a substitute. Thus, our findings offer an important nuance: in a context where professional autonomy has historically been strong, online worksheets play a supporting role rather than a replacement one.

5. Conclusion

The main objective of this study was to analyse the access to, methods of use and impact of online lesson plans on the pedagogical autonomy of mathematics teachers in Years 7 and 8 of Basic Education in Kinshasa. More specifically, the study sought to: determine the extent to which teachers have access to online lesson plans; identify the means and frequency of use of these resources; examine how teachers make use of the digital lesson plans; and assess their impact on teachers’ pedagogical autonomy. The results reveal several key findings.

Firstly, access to online lesson plans remains limited (33 per cent), highlighting the technological and infrastructural constraints in the context under study. The majority of teachers never use these resources (66.6 per cent), indicating that the integration of digital technology into lesson planning remains marginal.

Secondly, for teachers with access to online lesson plans, the mobile phone is the primary means of access, confirming the importance of mobile digital technology in the Congolese educational context.

Thirdly, contrary to certain assumptions that online resources might reduce pedagogical autonomy, the majority of the teachers concerned (71.4 per cent) believe that these worksheets actually enhance their autonomy. Furthermore, 100 per cent of them stated that they used to prepare their own worksheets before digital resources were available, and none currently rely exclusively on online worksheets. These results show that teachers maintain an active and critical professional stance towards digital resources. From a scientific perspective, this study makes a significant contribution to research in mathematics education and educational sciences in the DRC. It empirically documents a reality that has as yet been little explored: the use of online lesson plans as a tool for lesson planning. It also highlights the fact that, in a context of limited resources, digital technology can be seen as a means of professional development rather than as a factor leading to standardisation or dependency. Furthermore, the findings align with the objectives of Sustainable Development Goal 4, emphasising the importance of equitable access to digital teaching resources for improving the quality of education.

However, this study opens up several avenues for future research. It would be worthwhile to: expand the sample to include other provinces in order to compare regional contexts; adopt a mixed-methods approach combining questionnaires, classroom observation and in-depth interviews; analyse the actual impact of online lesson plans on pupils’ performance; to examine the link between in-service teacher training and the use of digital resources. Ultimately, this research shows that

the integration of online lesson plans into mathematics teaching in Basic Education in the DRC is still in its early stages, but that it represents a promising opportunity for strengthening teaching practices and teachers' professional autonomy.

Bibliographical References

- Alexandre Mopondi Bendeko (2015). *Mathematics pedagogy: contextualising teaching in the Democratic Republic of the Congo*. Paris: L'Harmattan.
- Altet, M. (2013). *Analysing and understanding teaching practice* (ed. with I. Vinatier; didactic analysis of interactions and lesson plans)
- Brousseau, G. (1998). *Theory of Teaching Situations*. La Pensée Sauvage (framework for designing learning situations, basis for lesson plans).
- CONFEMEN (2019), PASEC 2019 Report: *Performance of the education system in the Democratic Republic of the Congo*. Dakar: PASEC.
- Frédéric Bola (2026). *Proposal for a didactic approach using a traditional game to teach arithmetic and geometric sequences*. PhD thesis, National Pedagogical University.
- IFADEM (2018). Teaching booklet: *Teaching French for and through mathematics*. Paris: Agence Universitaire de la Francophonie (Refers to accompanying documents and fact sheets available on Éduscol).
- Ministry of National Education. (2014). Circular No. 2014-088 of 20 May 2014 concerning preparations for the start of the 2014 school year. *Official Bulletin of the Ministry of National Education*.
<https://www.education.gouv.fr/bo/14/Hebdo21/ME/NE1411580C.htm>
- United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development* (Goal 4: Quality Education; includes the promotion of open educational resources online).
<https://sdgs.un.org/2030agenda>
- Perrenoud, P. (1996). *Teaching: Acting in a state of urgency, deciding in a state of uncertainty. Knowledge and skills in a complex profession*. ESF Éditeur (2nd ed., 1999; discusses the skills required to plan teaching sequences)
- Roger Muhindo Binzaka & Emmanuel Kanyamuhanda (2020) 'Practices of cognitive activation through tasks in primary school mathematics teaching'. *European Journal of Education Studies*.
- Tardif, J. (2017). Conceptual frameworks regarding the notion of competence, its development and its assessment. In M. Poumay, J. Tardif & F. Georges (eds.), *Organising training based on competences: A winning strategy for learning in higher education* (pp. 15–37). De Boeck Supérieur
- UNESCO. (2019). *ICT Competency Framework for Teachers (ICT Competency Framework for Teachers)*.
https://unesdoc.unesco.org/ark:/48223/pf000026572_0