

A Design-Based Research Approach to Bridge Teacher Aspirations and Goal-Setting

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ICTD research has often faced challenges in transferring findings across different projects or general HCI due to its specificity to local communities. Theory-driven research, such as aspirations, can bridge work across communities. However, designing technology for emerging theories like aspirations is inherently complex. This study employs a Design-Based Research (DBR) methodology to explore designing digital tools for teacher aspirations in rural Côte d'Ivoire. First, we interviewed teachers and found the important role of digital literacy in their aspirations. Then, we conducted four focus groups with 16 teachers to understand their weekly planning practices and challenges. We found that teachers rely on collaboration to help set goals and classroom activities, but this collaboration was inconsistent and often inaccessible. Based on this context, we designed a prototype in Google Forms to scaffold planning for teachers and evaluated it through four additional teacher focus groups. Completing a DBR iterative cycle, we reflect on design principles to further develop similar technological supports for teachers in low-infrastructure contexts. The study contributes by demonstrating the value of DBR in designing for teacher aspirations and highlighting the importance of digital literacy, collaboration, and goal-setting in achieving teacher aspirations.

CCS Concepts: • **Human-centered computing** → **Empirical studies in HCI**; • **Applied computing** → **Education**;

Additional Key Words and Phrases: HCI, ICTD, aspirations, HCI4D, career, teachers, teacher professional development, teacher training, goal setting

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1 Introduction

Although **information and communications technology and development (ICTD)** research projects have spanned across multiple countries, a major limitation is the specificity of the findings to local community [24], making it hard to transfer research ideas across projects or to general ICTD [13]. A promising opportunity for the transferability of ICTD research is the emerging drive for engaging with theory, such as communities of practice [69, 86], asset-based design [66], or aspirations [82] to name a few. In recent literature, the aspirations theory has emerged in many topics such as healthcare [46, 67] and education [19, 80] after Toyama’s call. Toyama suggests ICTD researchers prioritize designing technology to help users achieve their long-term desires that provide pathways beyond their current situation [82]. This approach has the potential to reach longer-term and more sustainable solutions. However, reaching these goals is challenged by the complexity and nuances of designing technology for aspirations [16, 82]. This article provides further experience addressing these challenges by studying teachers in rural Côte d’Ivoire.

Prior work in this context identified an aspiration for teachers in Côte d’Ivoire was students success [19] as seen through their students improving in the short term. Various teacher **professional development (PD)** programs align with these aspirations, focusing on student-centered activities [40]. However, these programs require teachers to reshape their perspectives from a student-centric mindset to a curriculum-centric one in this context. Such a mindset change potentially makes it hard to implement these programs in developing countries [56, 77]. Additionally, in low-infrastructure contexts where economic, transportation, and technology resources are scarce [10, 41], many PD programs do not provide adequate support for teachers in important aspects of PD [16]. As mobile technology proliferates globally, there is potential for technology to scale and support teachers in all areas of pedagogy [17, 61, 83].

We describe the **design-based research (DBR)** [8, 27] approach that engaged with teacher aspirations to uncover insights into technology design. DBR is an iterative methodology to engage with communities to uncover design and theoretical findings. Prior work has used DBR to design for complex environments in ICTD, such as phone-based technology for children [53, 54] and designing a mobile application for breastfeeding mothers [85] to name a few. The DBR design cycle typically follows an iterative (1) analysis of the context, (2) design and prototyping, and (3) evaluation and reflection.

This article presents findings from applying a DBR approach (see Figure 6) to support teachers implementing a pedagogical program in rural Côte d’Ivoire. In this article, we focus on a specific aspect of the program, so-called session planning,¹ which is described in the next sections. Following the DBR methodology, we address the following research questions:

- **RQ1: CONTEXT:** What is the role of digital tools in supporting teacher aspirations in rural Côte d’Ivoire?
- **RQ2: EXPLORATION:** What support do teachers have for goal-setting towards their teaching aspirations?
- **RQ3: PROTOTYPING:** What are teachers’ initial reactions to a technology that supports structured goal-setting?

¹session planning was a weekly lesson plan prepared by the teachers implementing the pedagogical program.

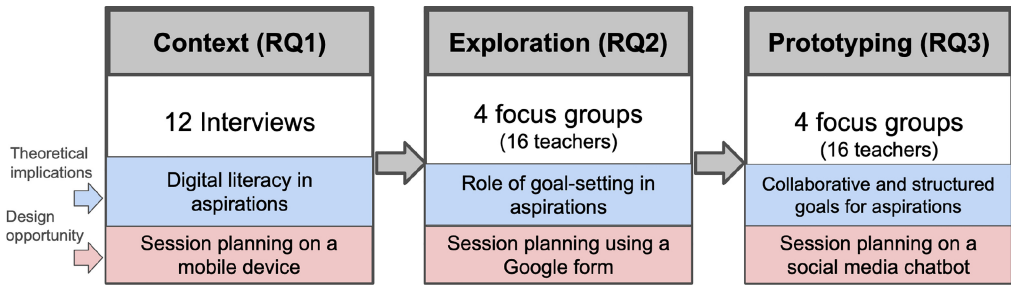


Fig. 1. Summary of the iterative DBR involving, i.e., (1) Context Analysis, (2) Design, and (3) Prototyping phases. We used Aspirations theory [82] in contexts of weekly lesson planning activities for teachers in Côte d'Ivoire. See details in Figure 6.

To answer these research questions (See Figure 1), (RQ1) we interviewed 12 teachers in rural Côte d'Ivoire regarding the role of mobile technology towards their aspirations. Then, (RQ2), we conducted four focus groups with 16 teachers to explore teachers' current session planning practices and existing challenges. After the first four focus groups (RQ3), we developed a prototype in Google Forms designed to scaffold goal-setting in teachers' weekly session plans and asked 16 teachers for their feedback. Finally, we compared our findings to our theoretical framing to identify design and theoretical insights. We start with related research, followed by more information on the research context in Côte d'Ivoire.

Our contributions to the HCI and COMPASS community are:

- Demonstrated the value of DBR in ICTD research for theory-practice integration.
- Highlighted the role of digital literacy in supporting teachers' career aspirations.
- Proposed designing ideas for collaborative goal-setting for rural teachers in Côte d'Ivoire.

2 Related Work

2.1 Aspirations in HCI4D

Human-Computer Interaction for Development (HCI4D) researchers have shifted focus from user needs [64] to designing for users' aspirations [82], to build sustainable systems [66] for low infrastructure settings. Toyama explains aspiration as an individual's *long-term desire that is persistent and aiming for something higher than one's current situation* [82]. Therefore, prior work in ICTD has explored aspirations in mental health [67], healthcare [42, 46], community networks [26], agriculture [33], and accessibility [48]. In education, prior work used aspirations to understand career paths for high school students [49], undergraduate students [45, 74], and vocational workers [80].

Understanding user aspirations is a powerful yet underutilized lens in HCI4D for improving research transferability and informing more contextually grounded design. Prior work shows that aspirations can serve both practical functions—such as shaping developmental indicators [32, 72]—and theoretical ones, especially when framed within Sen's capability approach, where aspirations are seen as a navigational capacity that marginalized groups may lack [3]. Studies like Kano et al. [45] and Kumar et al. [49] demonstrate how role models and future-oriented goals influence user behavior, suggesting design pathways that move beyond usability to empowerment. Despite this promise, few studies in Africa have leveraged aspirations as a foundation for technology design. Thus creating an opportunity to leverage the theory in the context.

For African teachers, aspirations have been explored for pre-service undergraduate teachers' aspirations (i.e., teachers in training) in South Africa [12]. A study on primary school teacher

aspirations in Côte d'Ivoire [19] discovered teacher aspirations for (1) *Students' success*: teachers expressed that they wanted to see their students improve on the curriculum over the short term and improve professionally in the long term; (2) *Improving teaching skills*: Teachers expressed aspirations to improve their teaching skills to support their class better; (3) *Career progression*: Teachers aspired to progress in their career to become advisors and inspectors to have a broader impact on the community. However, teachers are often impeded by challenging civil service exams, and the aspirations for career progression conflict with their current teaching role, complicating the design space. A subsequent study [16] proposed technology design ideas and building community-based interventions for teacher aspirations. Goal setting and aspirations have been studied in economics literature [34], with goals being an intermediate step towards aspirations, as observed among youth in the UK. However, goal setting and aspirations work together have yet to be extended to the ICTD literature.

2.2 DBR and ICTD

DBR [8, 27] is an iterative educational research approach designed to bridge the gap between theory and practice [2]. It arose in response to the perceived shortcomings of traditional research methods in enhancing classroom practices [4]. In DBR, researchers are seen as change agents and research subjects as collaborators, focusing on developing new designs and theories through an iterative process of design and evaluation [4].

DBR differs from **Research through Design (RtD)** [88] and **Design Science Research (DSR)** [37] in its primary focus on learning sciences and generating theoretical insights within real-world settings, especially in learning sciences. Unlike RtD, which emphasizes the design process and reflection on artifacts for knowledge generation, DBR involves *iterative* cycles of *design*, *implementation*, and *reflections* of educational interventions in close collaboration with practitioners, such as teachers or learners. This makes it highly participatory and responsive to academic challenges, contrasting with DSR's focus on creating and rigorous evaluation of artifacts for problem-solving in fields like information systems [37]. DBR's strength lies in its *collaborative, real-world application*, where the contextual, iterative feedback from stakeholders directly informs both the design and the underlying educational theory. This is especially relevant in ICTD projects, where understanding local educational contexts and developing context-sensitive solutions are crucial.

DBR provides transferable insights through iterative collaboration, while **Action Research (AR)** [35, 36, 50] often faces challenges with generalizability and objective evaluation. DBR excels in balancing theory and practice, generating practical interventions and theoretical insights that are often transferable across contexts. Its iterative cycles of design and refinement, alongside close collaboration with practitioners, ensure solutions are both practical and evidence-backed [8, 27]. In contrast, AR, while highly participatory and empowering, often suffers from context-specific results, limiting generalizability and making objective evaluation difficult due to the subjective nature of researcher involvement. It is also time-intensive and sometimes lacks the rigorous data collection typical of more structured methodologies [36, 50]. Although AR has been used in ICTD research [36, 65, 85], it faces the shortcomings of balancing timely contributions for academic and real-world impact.

The dual focus of ICTD research on academic contributions and real-world impact makes it a valuable area for applying DBR methodologies. Key features of DBR include [8, 27] iterative cycles, collaboration between researchers and practitioners, and contextual relevance for end users. Research in ICTD follows similar principles to design context-sensitive technologies tailored to the unique needs of underserved communities [30, 60, 65, 73]. Although DBR has been used in educational interventions within ICTD [15, 54, 55], we extend DBR theory to our project.

2.3 Teacher PD in Low-Infrastructure Contexts

2.3.1 Prior Experience. Significant research highlights that ongoing and lifelong professional learning is essential for supporting teachers [29, 43, 44, 78]. Practical approaches include providing teachers expert feedback during teaching sessions through thoughtful reflection [9]. Teacher growth is non-linear, necessitating personalized support to build individual teacher capacity [22]. Literature from the Global North has developed materials to foster self-efficacy, self-reflection, and collaboration, sometimes using interactive tools [5, 23, 31, 38, 75]. However, the applicability of these approaches in developing contexts, where experts are less readily available, remains uncertain [10].

Despite evidence that teacher training programs improve children's education in developing countries, implementing these programs in rural contexts presents significant challenges [6, 25, 57, 70]. These challenges include the need for a cultural shift in teaching beliefs and practices and the difficulty of implementing new pedagogical approaches without frequent mentoring [1, 56, 77]. Infrastructural issues, such as poor roads and high travel costs, complicate the frequency of mentoring visits by educational ministry officials, making it difficult to provide the necessary support for teachers in rural areas [10, 41, 62]. Therefore, supporting teachers in these contexts with additional mentoring and support is essential to implement pedagogical programs effectively.

There remains an open design gap in designing technology that supports goal-setting for teachers in rural contexts. In Côte d'Ivoire, prior work has explored the role of chat-based systems in supporting teacher communities. Motteram and Dawson [61] found that WhatsApp groups could foster **virtual communities of practice (vCOPs)** among language teachers, but poor connectivity limited usage. Sparse cellular infrastructure and costly data plans continue to restrict internet access for rural teachers [15, 61]. Therefore, Cannanure [15] piloted [16, 17] and evaluated [18] chatbot-based systems, that work for intermittent connections to support teachers implementing a teaching method. Few have explicitly addressed how such tools can scaffold goal-setting—highlighting an open design opportunity.

2.3.2 Goal Setting for Teaching. Goal setting is when teachers map out daily activities in the context of frequent (e.g., weekly) goals for themselves and their students, fostering a structured approach to improving educational outcomes. Goal-setting theory, pioneered by Locke and Latham, emphasizes the importance of clear and challenging goals in motivating individuals to achieve higher levels of performance and is a critical component in the PD of teachers [52]. Research has shown that when teachers set specific, measurable, attainable, relevant, and time-bound (SMART) goals, they are more likely to enhance their teaching practices and student performance [51]. Goal setting also has a directive effect, i.e., it channels and energizes teachers' activity towards relevant activities [14, 51]. Additionally, goal setting in the context of aspirations can orient an individual towards their future state [34, 76]. Lastly, teachers need to put a learning goal instead of an outcome-oriented one for them to reap benefits [14].

In primary education, studies indicate that primary school teachers who engage in goal setting tend to adopt more innovative teaching strategies and better classroom management techniques [71]. Furthermore, the involvement of students in the goal-setting process has been found to increase their engagement and motivation, leading to improved academic outcomes [59]. Teachers in primary education often focus on goals related to literacy and numeracy, which are foundational skills critical for students' future academic success [28].

Implementing goal setting for teachers in low-infrastructure contexts presents unique challenges and opportunities. Despite limited resources, goal setting can provide a framework for teachers to prioritize their efforts and maximize the use of available materials [87]. In such environments, goals may be oriented towards basic educational needs, such as improving student

attendance and retention rates and enhancing basic literacy and numeracy skills [21]. The success of goal setting in these contexts often relies on external support, such as community involvement and assistance from non-governmental organizations, to provide the necessary resources and training for teachers [7].

In summary, while HCI4D has shifted to focus on users' aspirations, there is a gap in applying aspiration-based theory toward practical teacher PD in developing countries' educational contexts. DBR [8, 27] is an iterative educational research approach designed to bridge the gap between theory and practice but underutilized in low-infrastructure settings. In Côte d'Ivoire, teachers' aspirations to enhance student success, improve teaching skills, and advance their careers face limitations and a lack of technology-driven interventions. Though goal setting helps teachers improve practices and student outcomes, there is a lack of mechanisms to support teachers.

In this study, teachers already used paper-based goal-setting activities called session planning. Through our combined DBR and aspirations lens, goal-setting emerged as an avenue toward teacher aspirations while also identifying potential paths for technology to improve the impact on teachers of the goal-setting within the session-planning process.

3 Research Context

This study is part of an ongoing research program supporting literacy and mathematics education in rural Côte d'Ivoire. The region primarily relies on an agricultural economy driven by cocoa and coffee production, which sustains most residents' livelihoods [47]. Within this context, a pedagogical program (*NewMethod*²) trains teachers to implement student-centered learning activities. An international NGO manages this program with research institutions and the Ivorian Ministry of Education. We worked closely with this NGO and obtained approvals from relevant institutional boards and the Ivorian government to conduct our study from May to October 2022.

The *NewMethod* program focuses on improving the skills of fundamental mathematics and French (the official language of Côte d'Ivoire) for 3rd, 4th, and 5th graders. Teachers begin by administering a baseline test to categorize students into three proficiency levels. Throughout the school year, they conduct daily 45-minute sessions using interactive, hands-on, and child-centered activities.

Teachers participating in *NewMethod* receive training in student-centered pedagogy and mentorship to help them create weekly session plans (See Figure 2). They meet weekly with school directors (local mentors) and fellow teachers to discuss their plans and challenges. Additionally, pedagogical advisors (remote mentors) visit schools to conduct classroom observations and provide feedback.

To support remote mentoring, the Ministry of Education collaborated with various partners to experiment with digital tools, such as chatbots, WhatsApp groups, and phone calls. A chatbot on Facebook Messenger allowed teachers to ask questions about *NewMethod* and receive responses from an NGO worker. Teachers also engaged in official and unofficial WhatsApp groups to discuss *NewMethod* with peers and administrators. Depending on infrastructure and teacher accessibility, phone calls further supplemented these communication channels.

The chatbot was designed based on prior work [16–18] to support teachers in rural Côte d'Ivoire by fostering a virtual community of practice and providing accessible educational resources. Hosted on Facebook Messenger for improved accessibility, the chatbot utilized a menu-based interface to enhance usability, aligning with prior research indicating that teachers preferred simpler designs. An introductory tutorial guided users through its features, ensuring a smooth onboarding experience. The community menu enabled teachers to share experiences,

²The program name is hidden to preserve the privacy of the communities.

WEEKLY SESSION PLAN

Mathematical Week _____

Level : _____

Objective : _____

Dates	Goals	Activities	Material	Durati on
☐	☐	☐	☐	☐
Monday				
Tuesday				

Fig. 2. Template of the weekly session plan for the *NewMethod* program (translated from French to English). Teachers were required to print these sheets and document their goals, activities, and relevant details for each day of the week.

ask and answer questions, and engage with lighthearted content in a dynamic, newsfeed-like format. An NGO worker moderated content through a dedicated dashboard, managing teacher queries and overseeing community contributions. More information can be found in the following article [18].

The NGO facilitated this research by collaborating with the university on the chatbot’s development and deployment. Leveraging its on-the-ground experience, an NGO worker contributed to shaping the research direction, providing key insights into teacher challenges, such as difficulties with session planning. The NGO also shared pedagogical materials, including session plan templates, activity guidelines, and instructional resources, helping refine the chatbot’s content and ensuring its relevance to teachers’ needs. This collaboration ensured that the research was contextually grounded and aligned with the realities of classroom implementation.

Self-Disclosure. Our individual experiences, research processes, and goals shape our research. Our team comprises HCI and ICT researchers, economists, and linguists whose backgrounds and objectives influence the data analysis. Based in the United States and Rwanda, our team has extensive experience conducting research in African countries. The first author, originating from a developing country, developed the protocols and analyzed the data in collaboration with the Ivorian team, NGO and faculty. We maintained weekly interactions with the local team and NGO to gather feedback on our analysis. Our future study aims to evaluate the effects of quality education on students at scale.

3.1 Methods

3.1.1 Interviews—for RQ1. Teachers at selected schools had been provided with training on and use of a chatbot to support the adoption of *NewMethod*. We conducted in-depth interviews with 12 teachers a year after the tool was introduced. Schools were selected based on recommendations by the administrators. Our interview protocol had questions to discover (1) the role of digital tools (chatbot, WhatsApp groups, etc) for teacher aspirations, (2) what *NewMethod* support they received from colleagues and trainers, and (3) their access and barriers to *NewMethod* knowledge. Interviews were semi-structured and lasted for about 45 minutes and were conducted by an Ivorian researcher in schools or towns near the school. Twelve teachers (2 directors and 10 teachers) were

interviewed. The U.S. research team designed the protocol, and the NGO and the Ivorian research team contextualized the questions for the participants. See Appendix 6 for the protocol.

3.1.2 Focus Groups—for RQ2. To better understand teachers' experience with *NewMethod*, four semi-structured focus groups were conducted with a facilitator. There were a total of 16 teachers in this part of the study. The facilitator asked open-ended questions to teachers about their general experiences with the *NewMethod* teaching training program. Teachers were asked what they liked about the program and what challenges they faced. Teachers also answered questions about their perceptions of the community within the program and the support they receive from mentors and advisors in pedagogy, session planning, and goal-setting. Finally, teachers were asked about their experiences with using technology to support the teaching training program. Each focus group lasted approximately 45 minutes. Refer Appendix 6 for the protocol.

3.1.3 Google Forms Prototype—RQ3. Teachers started the form by writing a goal for the week (Weekly Goal). They were then asked to categorize their goal according to high-level categories: Supporting Students (improving students' vocabulary, improving students' knowledge of numbers, etc.), Seeking Help (asking mentors for guidance, asking about goal-setting, etc.), and Knowledge of Teachers (i.e., content knowledge of *NewMethod*, knowledge of teaching activities). After selecting a category, teachers saw a short list of example goals related to that category. The example goals were selected from prior data where teachers had shared their *NewMethod* goals. Teachers could then choose to revise their goals after seeing the examples.

After setting a Weekly Goal, teachers were provided a checklist of activities. They selected appropriate activities for each subject that best aligned with their goals. They were then prompted to explain their reasoning for writing a goal and selecting relevant activities. Finally, teachers were asked to provide feedback on the process of goal-setting and usability feedback on the prototype.

Focus Groups—RQ3. We received feedback on the prototype with four focus groups and a total of 16 teachers. After the facilitator asked about teachers' experiences with the teaching training program, the facilitator introduced teachers to the prototype and gave instructions on using the Google Form prototype on their mobile devices. Teachers took approximately 5–10 minutes to complete the Google Form. After all teachers had finished using the prototype, the facilitator asked final feedback questions to get the teachers' experience with using the prototype. The goal was not to evaluate the prototype but to use it to start a conversation about design directions for supporting goal setting using technology. Refer Appendix 6 for the protocol.

3.1.4 Data Analysis.

Interviews. First, we transcribed and translated the interview data from French to English. The first author went through the transcripts and formed the codes using an inductive approach [11, 20, 63, 79]. As a group, we considered the relationship between the codes and categorized them according to the main research questions. Some codes were *NewMethod* motivation: challenges: additional workload, and *NewMethod* knowledge: manuals help with learning. We then discussed the codes and the quantitative results with our research collaborators and modified the codes based on our discussions. Some final codes were aspirations: tech literacy is helpful for exam preparation and tech adoption: offline usage is helpful. These codes were edited to improve their readability for discussion. From the larger set of codes, we identified codes relevant to digital tools.

Focus Groups. We transcribed focus group sessions and translated the transcripts from French to English for analysis. We analyzed the data through affinity diagramming, a common method for analysis of open-ended, qualitative work in HCI [39]. The first and second authors first took notes on each of the transcripts and then discussed relevant aspects of the transcripts. We then

put relevant quotes from the focus groups onto sticky notes in Miro [58], labeled by each focus group. These sticky notes were arranged based on emerging affinities. We continued iterating on these affinities until we achieved high-level themes and subthemes that applied to all focus groups. From the larger set of themes, we identified themes relevant to session planning.

4 Findings

4.1 RQ1: Role of Digital Tools in Supporting Teacher Aspirations

The goal of this section is to set the context for teachers use of digital tools and their motivation to use them.

4.1.1 Technology Literacy was Integral for Career Advancement. Teachers wanted to progress in their careers to become advisors and mentioned that technology played a role in supporting them. Their career advancement goals required teachers to take additional initiatives outside their teaching to succeed in the civil service exams. For example, teachers mentioned taking part-time courses or preparing for exams after school hours. Teachers mentioned using digital tools to access documents and take online courses to support themselves toward their future goals. Specifically, teachers noted that they used the Internet to access content from the official websites, take online courses, and register for the exam on the official website. They also found value in searching for new online resources from different parts of the world, i.e., they would go to Francophone European websites and download exam material.

Yes, I am always connected to the Internet. I go to educational platforms, i.e., the universities and large schools outside, to learn how things work there. - T150

4.1.2 Using the Chatbot Helped Teachers Gain Technology Literacy. Teachers were provided with brief digital training to use the chatbot during *NewMethod* teacher training at the start of the year. Teachers mentioned that they struggled with learning to use technology and training for the chatbot provided a pathway to improve their digital literacy. Teachers expressed that they learned the basics of using their phones from the chatbot, which they mentioned was transferable to other applications and tasks for preparing for career advancements. For example, teachers noted that knowing how to download and read documents on their phones for the *NewMethod* manuals helped them download material for civil service exam preparation on their phones. Overall, they felt that the chatbot allowed them to improve their digital skills.

Learning the chatbot helps us use and not remain on the sidelines of computer tools. Today, the use of software and the Internet is needed everywhere. - T184

4.1.3 Social Connections on WhatsApp Helped Teachers to be Motivated as Well as Study for Professional Service Exams. For exam preparation, teachers often accessed a separate support network, typically forming or joining study groups outside their immediate teaching community. Some teachers mentioned using social media to stay connected with these groups, which often included like-minded individuals from various parts of the country preparing for career advancement. Additionally, teachers formed study groups through personal connections with family members or close friends. These groups and connections provided valuable content and motivation for teachers to read in their free time. Additionally, since many were preparing beyond their regular school hours, the regular reminders from other members' activities motivated them to stay on track with their preparation.

Yes, a lot because I'm in WhatsApp study groups, and almost every day, we learn many things from these WhatsApp groups, and in my free time, we try to exercise, even though I don't know anyone in these groups. The *NewMethod* WhatsApp group could

help me too, because you always have to expose what you don't know, and someone nearby may have the solution - T228

4.1.4 Reflections. Teachers reported that staying updated with the latest technology was essential for their career progression, as it enabled them to take online courses, access exam materials, and enhance their digital literacy. Teachers utilized digital tools and the Internet to support their exam preparation, frequently visiting educational platforms and downloading resources. The use of the chatbot during *NewMethod* training helped improve their digital skills, making it easier for them to prepare for exams. Social connections on platforms like WhatsApp played a significant role in motivating teachers to study, as they formed study groups to share resources and stay engaged with their exam preparation.

In prior work, teachers reported that *NewMethod* goals were [16] aligned well with their aspirations. For example, implementing child-centric activities provided personal and pedagogical benefits, refreshing their initial training, and preparing them for future mentorship roles. These findings motivated us to develop further digital tools that were designed to promote digital literacy for setting goals for *NewMethod*. Additionally, prior work has mentioned the important role of goal-setting as an important intermediate step towards aspirations [34, 68]. After discussions with our NGO collaborators, we chose to focus on *session planning*, a weekly goal-setting activity mentioned by our collaborators as an important problem among teachers in the context.

4.2 RQ2: Teacher Support for Goal-setting towards Their Teaching Aspirations

4.2.1 Regular Goal-setting was a Step Towards Improving Students Progress. As per prior work, teachers aspired for children to improve their learning outcomes. Teachers realized that adapting their methods to a more friendly and playful learning atmosphere was helpful to support struggling students. Teachers in all focus groups mentioned the importance of a playful atmosphere to help students come out of their shells and to help them participate. Therefore, unlike traditional teaching, teachers actively incorporated playful activities and changed their demeanor to help their students learn.

NewMethod is learning through play which is our teaching method. For the child, everything starts with the game, so as we play with the children, they are really happy. I like it myself and I get on the children's level, I do what they do and enjoy it inside. - FG2



Fig. 3. *NewMethod* weekly meeting.

However, these playful activities were within a well-structured session plan, which teachers filled out weekly (See Figure 2). They set weekly goals for their *NewMethod* activities as part of the plan. All the school teachers set the *NewMethod* goals for the coming week during a Friday

meeting (See Figure 3). Unlike lesson plans based on the curriculum, goals for *NewMethod* were set based on the student's behavior during the previous week. Therefore, teachers had to observe the students' performance to adapt future lessons and improve their learning experience. Teachers used their observations to make daily goals for the rest of the week. "*Depending on the child's difficulties, we do the planning*" (FG1).

A daily plan helped teachers pick appropriate activities and lesson material for each 45-minute *NewMethod* session. Additionally, having a plan for the day helped them get feedback from their superiors toward improving children's learning. They mentioned they would get quick feedback on their daily plans from the director, who was a local mentor. Additionally, they mentioned that this plan also helped remote mentors, i.e., pedagogical advisors who would visit the schools monthly.

We do it with the director; for example, we present our session plans to him, and every day, we present the lesson plan. Now, when the counselors find us here, it's not a training that they give us as such but give us advice on what they have seen to put us on the path. - FG3

4.2.2 Teachers Worked Together with Their Peers to Set Their Goals. Another aspect of session planning was that it was collaborative. A school's teachers met weekly and worked on their goals and activities for their respective classes. Teachers discussed the challenges and successes of implementing *NewMethod* activities during the week in the meeting. These discussions allowed them to calibrate their goals and set activities according to the shared experiences of their fellow *NewMethod* teachers in the school.

For preparation of the session plan, we sit down in a collegial way, and everyone (all teachers) gives us their weekly experience, and as a result everyone adapts their objectives accordingly. - FG3

The session plan also allowed teachers to receive and provide feedback to peers outside their schools. Teachers in Côte d'Ivoire had an intrinsic sense of collegial solidarity [16, 19]; therefore, session plans allowed teachers to reach out to their peer network, often teachers from neighboring schools or nearby towns. Teachers also mentioned that they would call their peers or receive phone calls from their peers about the session plan. Lastly, the administrators also encouraged collaboration in setting goals, as it allowed teachers to learn from each other

There were colleagues who had difficulties in developing weekly or monthly session plans... I think there is no shame in learning that if you have a difficulty, you should see a colleague to help you, because we do it for the well-being of the children - FG1.

Teachers also contacted their local and remote mentors for their support on session plans. Either getting daily feedback from the school director or receiving feedback during counselor visits. Across all focus groups, teachers mentioned the importance of having access to mentors for guidance. The mentors met the teachers from a school in a group meeting. Teachers expressed a sense of community with their peers in help-seeking, "*Everyone poses their problems and then if there is a solution, it is collective*" (FG8). Visits from mentors were especially useful for timely help,

It must be said that the counselor also spends a lot in the schools and so when he comes if we have questions, we ask them and he gives us answers - FG5.

4.2.3 Teachers Lack Consistent Access to Mentorship and Support for Goal-setting. Despite teachers wanting to collaborate, they mentioned frustration at the lack of consistent access to mentorship and resources. One of the difficulties was cancellations or interruptions of the weekly meetings where teachers and mentors gathered to discuss session planning. Teachers often experienced disruptions in their weekly meetings due to external events such as administrative meetings,



Fig. 4. Examples of images of *NewMethod* activities shared by teachers on social media.

sports events, or holidays. The administrative meetings would usually happen in offices far from the schools and teachers' homes, disrupting their school routine. *"We have a lot of difficulties especially the weekly meetings because we often have meetings in town. So, we don't have the weekly meetings"* (FG8).

Interruptions also meant that they do not finish planning in their weekly meetings, often repeating their earlier activities or doing generic activities due to lack of preparation, *"[At the weekly meeting], we have to present the weekly session plan, and we will discuss this program to see if it's good or make changes.... And yesterday we were interrupted for a particular problem because..., which means we repeat the same activities as before"* (FG3).

Teachers also mentioned that mentors did not visit frequently enough for weekly meetings, *"If as advisors, they can come...so that they improve our working conditions, it will do us good. We had told them..., and they did not come back even though we want to do it right"* (FG3). Without guidance and mentorship, teachers reported that they often did not get to complete the session plan to set their weekly goals. The scarcity of mentors and inconsistent mentor visits contributed to teachers' frustrations, *"Then the director asks everyone what's wrong, and everyone expresses themselves. ... So, we explain to him, he says okay and when he goes to submit this to the advisor, we never heard back"* (FG6).

In addition to inconsistent mentorship, teachers discussed the lack of resources needed to carry out learning activities. As a result, teachers sometimes skip activities they originally planned to do, *"Regarding the session plans, there are certain activities, when I want to develop them, I think of the feasibility in my class, I have to leave some when everything is planned and necessary for the children but as the framework is not conducive to doing so, so I skip some activities"* (FG3).

4.2.4 Mobile Technology and Social Connections for Goals. As in-person support was inconsistent, teachers used mobile technology to collaborate. Teachers mentioned that they posted on social media groups such as WhatsApp and Facebook to seek support from their broader peer network (See Figure 4). Teachers use social media to share their experiences to show others their progress and success, *"We communicate our experiences [through technology] to others so that the final objective is achieved.... We improve through exchanges because it is a program where we need to hear from each other. Alone we can't succeed, that's why the experience of all is beneficial to us. It must help us to progress"* (FG1).

Posting to social media also served as a form of social validation, as teachers received feedback from their peers on their stories *"Often we send anecdotes, for example, while doing the activity, [the teacher] publishes it and then he says, 'Here is what I did as an activity, did I do well?'"* (FG2). Teachers would also get feedback from posting photos of their sessions. For example, posting that

they were conducting a *NewMethod* activity with a class allowed others to provide feedback on the student-teacher seating arrangement, grouping, and so on from mentors and peers on their social media. They would also receive encouragement from their peers, motivating them to continue implementing activities.

Teachers wanted to stay connected to peers and mentors to help with pedagogy and set goals. Teachers used technology to seek help with *NewMethod*, especially in making phone calls to mentors, “*if I don’t understand something, I get back to the adviser.... I call on my manager*” (FG5). However, teachers also mentioned that the lack of connectivity prevented them from being able to connect via technology, “*We may need information to get help, but lack good network coverage.... There are times when there is network and times when you have to move to the neighboring village [and lose connection]*” (FG7). As a result, teachers are not fully able to take advantage of online resources.

4.2.5 Reflections. Teachers set weekly session plans based on observed student behavior and adjusted daily plans accordingly. This process involved collaborative planning with peers and receiving feedback from local and remote mentors. Teachers faced challenges such as inconsistent access to mentorship, resources, and meeting times, leading to disruptions in their planning and goal-setting. To address these issues, teachers used mobile technology and social media for support, sharing experiences, and receiving feedback from their broader network. This approach helped them stay connected and motivated, although connectivity issues sometimes limited the effectiveness of online resources.

These findings motivated us to design a digital tool that enabled remote session-planning activities. In response to teachers’ thoughts and experiences mentioned in the four initial focus groups, we developed a prototype within Google Forms. We chose Google Forms for prototyping in low-infrastructure contexts because of its familiarity, ease of use, and low bandwidth [16]. Our design goals were for the prototype to be simple and quick to use, adaptive to teachers’ individual goals and needs, and relevant to their challenges in session planning. The forms were modeled on the paper session-plan template (see Figure 2). We used a dataset shared from a prior study in Côte d’Ivoire [15], which had goals shared by teachers in the context of *NewMethod*. The NGO workers helped us create daily goals and sample activities for the selected individual goals. The NGO wanted teachers to have autonomy in creating their plans. Therefore, the prototypes were designed to reflect on the planning and goal-setting process and reinforce crucial concepts, such as connecting weekly goals to appropriate daily activities related to them (See Figure 5.).

4.3 RQ3: Teacher’s Initial Engagement with a Google-form Prototype for Goal-setting

4.3.1 Goal Categories. From the focus groups and subsequent deployment of the prototype, we received 21 teacher responses. Teacher goals were categorized as 13 (61.9%) supporting students, 7 (33.3%) teacher knowledge, and 1 (5%) help-seeking. One example of a student knowledge-centered goal listed was “*Enable children to write and read numbers*” while an example of a teacher knowledge-centered goal was “*My goal is to better do the weekly session plan.*”. The adaptive version of the form was focused on the French activity, while we had a sample activity for Math.

4.3.2 Teacher Feedback. After setting their goals, teachers were asked what they liked about using the prototype and what could be improved. Teacher feedback was categorized into five themes: student knowledge building (47.6%), session planning concepts (42.9%), student ability (19%), teacher knowledge building (19%), and teacher skills for supporting students (9.5%). From the experience, teachers noted learning about building student knowledge such as the “*Recognition and calculation of numbers.*” Many teachers also noted learning more about session planning concepts like the “*difference between weekly and specific goals.*” Teachers noted that they learned

French lesson plan

Please write your weekly goal for French *
below
Use the diagram as a reference

PLAN DE SESSION HEBDOMADAIRE

Niveau	Objectif	Dates	Objectifs	Activités	Processus de classe	Matériel	Durée
Level							

Weekly goal ...

Back Next Clear form

STUDENT SUPPORT

Select your specific goals *
Use the diagram as a reference

PLAN DE SESSION HEBDOMADAIRE

Niveau	Objectif	Dates	Objectifs	Activités	Processus de classe	Matériel	Durée
Level							

- ☐ Improve listening skills
- ☐ Improve speaking ability
- ☐ Improve self-confidence
- ☐ Allow children to express themselves using an image
- ☐ Connecting the image to personal experience
- ☐ Other:

Activities

Select your activities for your goal *
Use the diagram as a reference

PLAN DE SESSION HEBDOMADAIRE

Niveau	Objectif	Dates	Objectifs	Activités	Processus de classe	Matériel	Durée
Level							

- ☒ Informal dialogue
- ☐ Description of images
- ☒ Reading simple paragraphs
- ☐ The word map
- ☐ The dictation
- ☐ Other:

Fig. 5. The Google Form prototype for setting a weekly goal (left), choosing a specific daily goal (center), and activities to support the goal (right). It is translated from the original French version.

techniques for teaching concepts such as “[mastering] the techniques for mathematics.” Teachers also mentioned learning about their students’ capabilities: “I learned from this experience that my students are capable of doing many things.” Some teachers also noted learning about developing skills to support their students’ different abilities: “Patience with students who have reading difficulties.”

Teachers found the prototype helpful for planning, appreciated the multiple-choice format, valued plan examples, and liked its adaptive, step-by-step guidance. One teacher said it made session planning “easier because I was guided.” Another teacher liked the choices given in the prototype: “What I liked is that these are multiple choice questions.” Teachers especially liked seeing the examples to help them create their session plan: “The advantage is that we see a bit of how we should proceed for the development of weekly objectives. They gave some examples of weekly goals.” Some teachers liked the adaptive nature of the prototype: “The questions taught us about the weekly plan in French and math; for example, they gave the different activities, and we are asked to choose the activities in relation to the course and the session plan.” Another teacher gave a specific example of this adaptivity: “There was no difficulty since these are the answers that are offered to us and it is according to question 1 that you answer question 2...”

There were also areas where the prototype could be improved. Teachers suggested copy-editing a few imprecise questions, noted goal-setting could aid usability, and many desired an offline version to address connectivity issues. Some thought the prototype questions were “imprecise.” Another mentioned that “if you set your goal well, it would be easy for you to answer the questions,” meaning that the prototype would help if a teacher already had a goal in mind.

4.3.3 Reflections. Teachers found the prototype helpful for planning, appreciated the multiple-choice format, valued examples, and liked its adaptive guidance. Teachers also suggested improving imprecise questions, noted goal-setting could aid usability, and many desired an offline version to address connectivity issues, highlighting the importance of adaptability and accessibility in the prototype.

These findings suggested that a digital tool, like a Google form, could support teachers with session planning. The prototype included various question types, such as multiple choice, text-based input, and image-based responses. Although not in real-time, content reflecting examples from the teacher community helped facilitate peer learning.

5 Discussion

In this section, we discuss the implications of our findings for aspirations theory, suggest design directions for a chatbot inspired by our findings, and reflect on the utility of DBR for ICTD research.

5.1 Digital Literacy and Scaffolding Goals for Aspirations

Our work adds to the body of literature highlighting the importance of digital literacy and aspirations in ICTD contexts [68, 82]. Our findings showed that digital literacy opened up pathways for teachers' career aspirations. Additionally, teachers' access to social media connections was helping them stay connected to peer networks, which motivated them to focus on preparing for their career aspirations. Prior work in ICTD literature has found the benefits of technology literacy for marginalized users. For example, in ICTD literature, technology training has been shown to build capacity in community volunteers [60], and digital literacy has created new job opportunities [81, 82]. The prototype was designed and proved an accessible technology stepping stone for reinforcing their digital skills. Future work should consider the vital role of technology literacy as a pathway for aspirations.

With our aspirations lens, we were able to recognize the potential to build on the existing goal-setting activities within teachers' weekly session planning. Through scaffolding (structuring) the goals to support user aspirations, the weekly and daily goals for *NewMethod* session plans offered a regular opportunity to engage with teachers' aspirations to support their students. Teachers recognized the application's structure as a platform to grow teaching competencies. Future work can invest in more systematic and pedagogically grounded goal-setting support for the teachers. More generally, this suggests technology designs can incorporate structured goals aligned with user aspirations. These goals can consist of specific actions closely tied to user aspirations, similar to how teachers' goals relate to student success in our findings.

5.2 Design Recommendations for a Social Media Chatbot to Support Collaborative Goal-Setting

The teachers demonstrated a commitment to community-based sharing of ideas and learning from each other. Based on previous studies in the Côte d'Ivoire context [16, 17, 61], a promising research direction involves designing a social media-based chatbot using popular platforms like WhatsApp [17, 61] or Facebook [15]. The chatbot could improve collaboration using suggestions from community members, i.e., leverage the broader community of practice [86] among the peer network of teachers. Teachers can be guided using content from their peers in different stages of goal-setting. For example, as teachers set a weekly goal, they can be shown similar goals from fellow teachers. These example goals can also passively guide teachers toward good goal-setting behavior. ICTD literature has used the concept of peer suggestions or social proof [84] across multiple media (video [30], audio [65], and text-based interactions [15]). Therefore, using the social proof model through peer suggestions can be structured (or scaffolded) into goal-setting stages, i.e., daily, weekly, and long-term goals, fostering a sense of collaborative goal-setting.

To address internet connectivity issues, the chatbot can have variable behaviors ranging from richer media in well-connected environments to low-bandwidth text-based interactions in poorly connected asynchronous and offline modes. Simple form-based interactions could be incorporated into the chatbot as adaptive and progressive questions, guiding users through the

session planning activity. Previous research has successfully used adaptive quizzes with children in rural Côte d'Ivoire settings [53]; a similar low-bandwidth and adaptive interaction approach could be extended to goal-setting behavior in a chatbot.

Teachers noted that interruptions and resource constraints limited feedback from mentors and pedagogical advisors. The chatbot platform, through **natural language processing (NLP)** and other tools, can provide an additional channel for feedback. The collected data can also be summarized using NLP to generate reports for administrators, leverage their limited availability, and provide more focused plans for their field visits.

5.3 Bridging ICTD Research Theory with DBR

ICTD research is often specific to local communities [24], making it hard to transfer across contexts or generalize to the broader HCI community [13]. Theoretical work, such as aspirations [82], offers promise for transferability, but designing interventions with these theories is often challenging. We showcase the benefit of using a DBR [8] approach to allow researchers to work with theory and practice to generate theoretical contributions and design outcomes (see Figure 6). Academics can leverage theoretical contributions to enhance academic impact while using the design outcomes to inspire future technology designs. Theoretical frameworks and DBR can address the dual focus on research and practical impact in ICTD research. Thus, DBR offers an avenue towards bridging theoretical ICTD, allowing transferability.

An example of DBR in the COMPASS literature is the work of Cannanure et al. [15], which illustrates how DBR can be used to co-develop educational technology with rural teachers in Côte d'Ivoire. In the first study, their work identified the relevance of teacher communities of practice and mobile applications through qualitative research [19]. In the second study, they worked with teachers and mentors to extend community support virtually [16], which shaped early design directions for a chatbot pilot [17]. This iterative process led to developing a conversational agent designed to facilitate virtual peer support among teachers [15, 16]. Preliminary findings showed that teachers highly valued community-oriented features [15]. In a final study [18], they compared two versions of the agent—one offering individual support and the other emphasizing community-based support. The study was conducted with 400 teachers showing that there were impacts of community based designs on teachers after a year. Cannanure et al. [15] work demonstrates how DBR can bridge theory and practice in ICTD. This article extends the conversation on DBR with a focus on aspirations theory to guide educational technology design. We expect our work to offer a pathway for more sequential studies bridging theory and design in other contexts.

Although other frameworks like RtD [88] and Design science exist [37], the collaborative nature and learning focus of our project favored DBR for our topic. Potential limitations of the DBR approach [15, 36] include multiple iterations, which require additional resources such as funding, personnel, and participant availability throughout the cycles. However, unlike AR [36], which takes much longer, DBR can use smaller studies or data from related contexts to circumvent some limitations of length. Future work can consider reflecting on the DBR approach through smaller studies and shorter timelines.

6 Conclusion

While ICTD research often struggles to transfer findings across different contexts due to local specificity, incorporating the theory of aspirations and DBR offers a pathway to bridge this gap. This study demonstrates the utility of DBR while designing technology that supports teacher aspirations in rural Côte d'Ivoire. Our interviews and focus groups revealed that digital literacy and collaboration are essential for teachers' professional growth. Yet, teachers frequently lack consistent support for goal-setting and classroom planning due to limited resources. By developing

and evaluating a Google Forms prototype, we showed that digital tools can enhance collaboration and assist teachers even in low-infrastructure settings. Our findings highlight the importance of integrating digital literacy, collaboration, and goal-setting into teacher development programs, providing design insights for future work. The study contributes to the COMPASS and ICTD communities by showcasing the value of DBR in integrating theory and practice to design technologies aligned with teacher aspirations.

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Appendix

RQ1: Interview protocol

In the following questions, we ask for examples. If participants say one word or short sentences, please ask them to tell you more.

Section A: Introduction

Before starting our main subjects, can you say your name, where you originally are from, and what is your career ambition? This interview is anonymous; we are asking your name to help with analysis.

Section B: Aspirations

- Which job do you expect to be working in 5 years?
- How do you plan to achieve this goal?
- Do you use technology to help you? If yes, can you give an example?
- Did you learn or experience anything from *NewMethod* that could help you achieve your goal? (Yes and no both are fine) Explain your reason.
- Did you learn or experience anything from *BOT* that could help you achieve your goal? (Yes and no both are fine) Explain your reason.
- Did you learn anything from the WhatsApp group that could help you achieve your goal? (Yes and no both are fine) Explain your reason.

Section C: *NewMethod* Implementation

- What do you like about *NewMethod*?
- Which aspects of *NewMethod* were easy to implement? Why do you think so?
- Which aspects of *NewMethod* were slightly difficult for you? Why do you think so?

Section D: *NewMethod* Knowledge

- How do you continue to refresh your knowledge about *NewMethod*?
- What resources do you use to improve your knowledge about *NewMethod*?
- Did technology help you learn new things about *NewMethod*? Can you give an example?
- How often do you have a meeting about *NewMethod* with the teachers in your school?
- What happens in these meetings?
- What do you learn from these meetings?

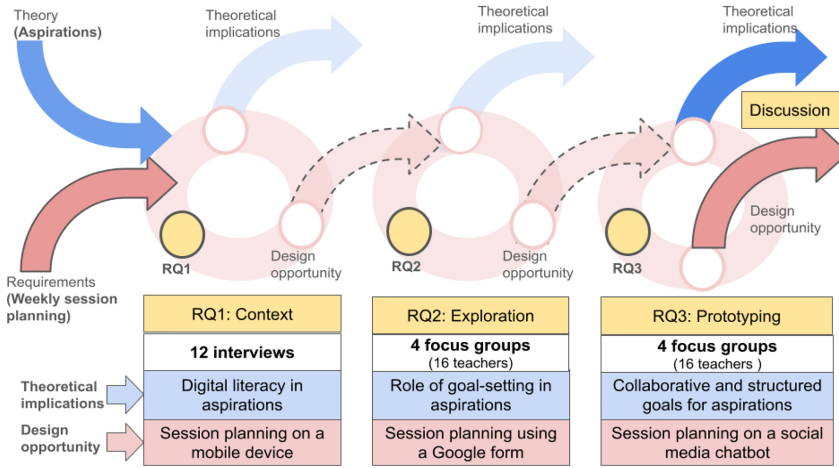


Fig. 6. Detailed summary of the iterative DBR [8, 27] involving the three steps of research, i.e., (1) Understanding Context, (2) Exploration of the Design space and (3) Prototyping. We used Aspirations theory [82] in contexts of weekly session (lesson) planning activities for teachers. Each table summarizes the analysis with the main design and theoretical implications. Lastly, we discuss theoretical insights and design implications from our whole study.

- How often do you set your session plan for *NewMethod*?
- Note: session plans are goals for *NewMethod*.
- Please explain how you make a session plan for *NewMethod*?
- What are some challenges you faced while implementing your session plan?
- What makes it hard to create a session plan?
- How have you addressed these challenges?

RQ2: Focus Group protocol

- What is one thing you enjoy about *NewMethod*?
- How do you plan for the *NewMethod* activities?
- How do you prepare for your session plan?
- What is your main difficulty with the session plan?
- How do you address this challenge?
- What are some other difficulties that you face with the session plan?
- Who helps you with the session plan? Can you give an example?
- Have you helped someone? Can you give an example?
- What do you think about *BOT*?
- What are some challenges in using *BOT*?
- How can *BOT* help you with your session plan?

RQ3: Focus Group protocol

Please ask four teachers to join you for the focus group. Ask each question and request each of them to respond. There are three parts to the activity.

Part 1/3

- What was your most memorable experience about the training?
- What is one thing you enjoy about *NewMethod*?

- What is your main challenge for *NewMethod*?
- How do you plan for the *NewMethod* activities?
- How do you prepare your session plan? Can you give an example?
- When and where do you prepare your session plan?
- What is your main difficulty with the session plan?
- How do you address this challenge?
- What are some other difficulties that you face with the session plan?
- Who helps you with the session plan? Can you give an example?
- Have you helped someone with their session plan? Can you give an example?
- Can you give an example of a weekly goal and an example of a specific goal?
- What is the difference between a weekly goal and a specific goal for *NewMethod*?
- How is the weekly goal connected to the specific goal?

Part 2/3

Ask all teachers to fill out the Google form. Share your WiFi.

Form: Google Form Link

Part 3/3

- What did you like about the Google form activity?
- What were some challenges while attempting the activity?
- What did you learn about goal setting for Math from this activity?
- What did you learn from goal setting for French from this activity?
- What do you think about *BOT*?
- What are some challenges in using *BOT*?
- How can *BOT* help you with your session plan?

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