Outlining an Experiment Design of Gamifying Language Learning in Low-Resource Contexts: Kurdish Learning in University, Language Courses, and on Web-Based Applications

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Abstract

Low-resourced and marginalized languages suffer from generational attrition, with dwindling incentives for younger speakers to learn a language to which they may be linked culturally but which offers limited opportunities for use in education, employment, and other domains of everyday life. Gamification techniques and the integration of digital support structures may hold considerable potential for language revitalization and digitization efforts. This work explores a research design that explores approaches targeting both extrinsic and intrinsic motivation for learners of Kurdish varieties across three contrasting learning environments. By running comparable conditions in environments that differ sharply in institutional pressure, cost, and voluntariness, we aim to produce a multifaceted account of how gameful design and behavior-oriented guidance interact with learner contexts, and thereby inform future initiatives in low-resource language learning.

1 Introduction

Language technology support differs radically across the world's languages. Only a very small number of languages are represented in language technologies and applications (Joshi et al., 2020). Kurdish, in contrast, is considered a low-resource language (Kamal and Hassani, 2020) with the lack of corpora as one of the main obstacles in Kurdish language processing (Abdulrahman et al., 2019). These resource limitations also make it more difficult to develop digital language-learning resources, since the tooling that supports gameful design in well-resourced settings, such as automatic assessment and generated feedback, is largely unavailable. Zhang (2026) highlights that availability of high-quality didactic materials is one of the reportedly prominent problems shared in minority language teaching (van Dongera et al., 2017)

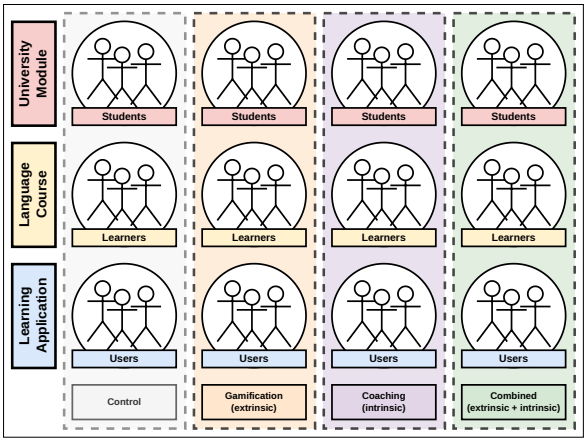


Figure 1: The condition matrix of the planned study in which rows correspond to the three environments and columns to the four condition families.

and that literature on Kurdish language teaching is still very limited (Muhammadamin, 2025; Resul and Muhammadamin, 2015). According to Zhang (2026), one of the proposed solutions is the integration of traditional and modern pedagogical methods (Ali and Saeed, 2025), something our planned work directly acts upon.

Gamification is commonly defined as "the use of game design elements in non-game contexts" (Deterding et al., 2011). Previous research has reported potential benefits of gamification for motivation, engagement, and learning-related outcomes, but reported effects remain inconsistent and appear to depend on the specific game elements employed, the learning context, learner characteristics, and the evaluation methods used (Dichev and Dicheva, 2017; Sailer and Homner, 2020; Luo, 2023). Much of this evidence base is drawn from well-resourced languages and from settings in which learners have a clear instrumental motive for study.

This assumption may not hold uniformly. For instance, Chinese student's learning Kurdish may reflect a mix of factors beyond institutional or ca-

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Proceedings of the 1st Workshop on Multi-modality and Multi-lingual Language Learning, pages 84–93
November 9, 2026 ©2026 Association for Computational Linguistics

reer incentive, including geopolitical engagement tied to the Belt and Road Initiative (Chaziza, 2024; World Bank, 2019), longstanding cultural and literary ties between the two peoples (Dadparvar and Shams, 2024), and identity-based motivations such as the Kurdish concept of *"beganeperestî"*, a documented tendency to value and support outsiders as an expression of cultural or identity-preserving duty (Jasim, 2024). If extrinsic incentives alone do not fully account for learner motivation in these contexts, gamification approaches that lean primarily on extrinsic feedback may be insufficient on their own, motivating our inclusion of an agent-based intervention targeting intrinsic, self-regulation-driven motivation.

Currently, there is a lack of research on how learners perceive the learning activities and gameful design in low-resource language-learning contexts. Neither is it clear whether findings obtained in one kind of environment transfer to another, such as a student facing examination pressure and a user of a free application who faces very different opportunity costs for disengagement. We therefore propose a study that holds the intervention families comparable while varying the environment, for which we formulate three research questions:

RQ1 How does gameful redesign of existing learning activities affect learning outcomes and self-reported motivation in low-resource language learning?

RQ2 Does the addition of an agent that targets self-regulation and learning behavior yield effects beyond those of gameful design alone?

RQ3 How do these effects differ across environments that vary in institutional pressure, financial investment, and voluntariness of participation?

2 Related Work

Kurdish Language Varieties Kurdish is part of the Indo-European language family and presents a diverse spectrum of varieties which use Latin, Perso-Arabic, and slightly modified writing systems (Tavadze, 2019). The most prominent variety-groups and their language codes according to ISO-639 are Northern Kurdish (kmr), also known as Kurmanjî (Haig and Öpengin, 2018), Central Kurdish (ckb), known as Soranî (Sheyholislami, 2021), Southern Kurdish (sdh) (Ahmadi et al., 2023), Zazaki (zza) (Dogan, 2024), Gorani (hac), often called Hewramî (Mohammadirad, 2024), and Laki (lki) (Belelli, 2021).

Kurdish' Low-Resource Status Ahmadi (2020) describes Kurdish as a less-resourced language and points out the lack of basic language processing tools. For Central Kurdish, Ahmadi and Masoud (2020) report scarce parallel data for Kurdish-English machine translation and more recent work finds that language technology resources are unevenly available across dialectal varieties (Ahmadi et al., 2024). Even though recent years have seen exciting progress in Kurdish natural language processing (NLP) (Hassani, 2018; Morad et al., 2024; Ahmadi et al., 2024), low-resource circumstances of language technology extend to the Kurdish learning context studied here.

Digital Language Learning Resources Digital language learning resources are used in many formats and learning contexts. In Computer-Assisted Language Learning (CALL), software and learning activities can be evaluated using criteria such as language learning potential, learner fit, meaning focus, authenticity, positive impact, and practicality (Chapelle, 2001). Research on mobile-assisted and gamified language learning also covers different types of applications, educational levels, learning settings, and evaluation measures (Ishaq et al., 2021). However, research on digital game-based second language (L2) learning has shown that most studies were conducted in formal learning environments and that English was usually the target language (Acquah and Katz, 2020).

Gamification in Language Learning Gamificaton is frequently used in language learning by integrating game elements such as points, feedback, quizzes, badges, leaderboards, rewards, and progress indicators into learning activities (Zhang and Hasim, 2023) These elements help provide feedback, and make learners' progress more visible. Such benefits do not always translate into better learning outcomes. A systematic review of foreign language learning research indicates that findings range from positive and negative effects to no differences (Luo, 2023). Existing evidence remains weak evidence for long-term effects and insufficient understanding of how gamification should be adapted to specific educational contexts (Dichev and Dicheva, 2017).

Self-Regulation & Behavioral Changes Self-regulated learning (SRL) describes learning as an

active process in which learners plan, monitor, and adjust their own learning. This includes setting goals, selecting and applying strategies, evaluating progress, and responding to feedback (Jivet et al., 2018). Major SRL frameworks conceptualize these activities as cyclical. Zimmerman (2000) distinguishes three phases: forethought, performance, and self-reflection; whereas Winne and Hadwin (1998) provide a more detailed account involving task definition, goal setting and planning, strategy use, and adaptation. Pintrich (2000) similarly organizes SRL around forethought, monitoring, control, and reflection, while emphasizing regulation across cognitive, motivational, behavioral, and contextual dimensions.

Behavior change theories offer a broader perspective on why and how behaviors change. Some focus on factors that shape behavioral intentions and actions. For example, the Theory of Planned Behavior (Ajzen, 1991) proposes that behavior is influenced by intentions arising from attitudes, perceived social norms, and perceived behavioral control. Related attitude-based accounts also emphasize the combined role of cognitive and affective factors (Zanna and Rempel, 2008). Other theories describe change as a progression over time. The Stages of Change Model (Prochaska et al., 1992), originally developed in health research, characterizes behavior change through a sequence of stages from precontemplation and contemplation to preparation, action, maintenance, and termination. These perspectives complement SRL by explaining not only how learners regulate ongoing learning, but also how changes in behavior may be initiated and sustained.

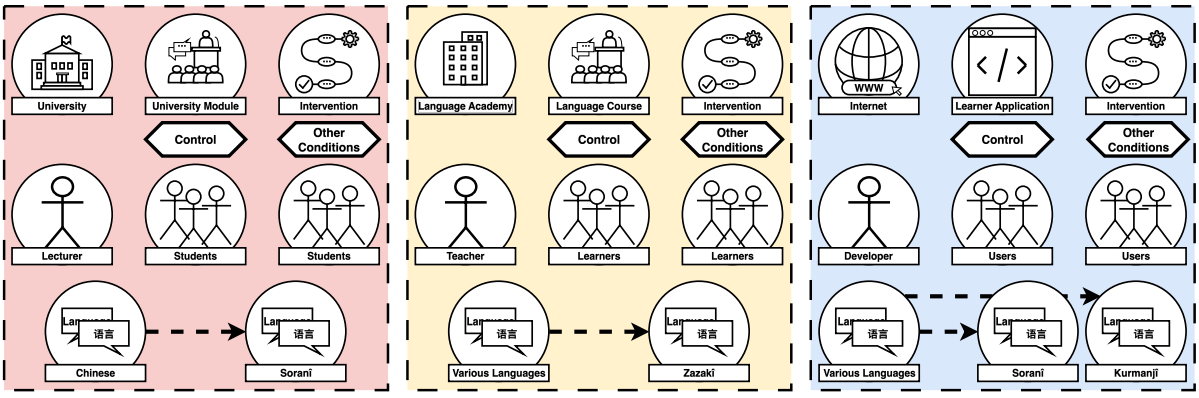
Evaluation of Deployed and Multimodal Language-Learning Systems When evaluating language learning systems, evaluation can consider both learning outcomes and learners' experiences with the technology. Evaluation frameworks in the field of CALL have incorporated learner-related factors when assessing technology-assisted language learning tasks (Aljohani, 2025). This is because the use of game elements may alter the way learners engage in activities, yet it does not necessarily lead to corresponding differences in learning outcomes. Zwitserlood et al. (2022) compared a tablet game vocabulary intervention with a non-game intervention using real objects. They found that learners' vocabulary improved under both conditions, but with no significant difference between the two intervention conditions. Sun et al. (2025) provides further evidence from low-resource language technology. They developed Dia-Lingle, a gamified interface to gather dialectal data with gamified levels of difficulty and active learning. In their usability evaluation, they reported a high level of overall user satisfaction. Qualitative feedback further suggested that varying difficulty levels could support continued participation.

Multimodal technologies have been explored to language learning in endangered and low-resource contexts, as illustrated by a multimodal corpus toolkit developed for Hawaiian language learning (Winkie et al., 2026). Montero-Pérez (2025) points out that research on multimodal language learning tools focuses on learning outcomes, such as vocabulary acquisition and language comprehension, and how learners process different types of input, including images, text, and audio. For example, Guichon and McLornan (2008) found that adding visual information and captions to audio input improved French university students' second language comprehension of authentic audiovisual materials.

3 Experiment Environments

We intend to study three environments, referred to throughout as *E1*, *E2*, and *E3*. They were selected because they place learners under markedly different incentive structures while sharing the common goal of learning a Kurdish language, which allows comparable intervention families to be instantiated in each. Yet, the environments differ in the source languages learner bring, in the Kurdish variety targeted, and in the degree to which learning activity in its entirety can be observed.

E1: University module. Chinese students take an elementary Kurdish module taught by a lecturer as part of a degree programme and learn Central Kurdish. This is the most constrained of the three environments, in that the stakes are high since failure carries academic consequences. Additionally, across multiple sessions per week, the lecturer gives instructions and explanations to then assign tasks to be completed both in class and at home. Traditionally, this type of environment is primarily analogue, with all participants meeting in the same room. We will introduce a digital platform that mediates (at least a selected subset of) the lecturer's assignments, and it is this platform that carries the



(a) *E1*, university module. (b) *E2*, language course. (c) *E3*, learning application.

Figure 2: Instantiation of the interventions across the three environments *E1*, *E2*, and *E3*. In each panel the responsible actor (lecturer, teacher, developer) supplies the learning activities both in a conventional form, which we call control condition, and in a redesigned form which is how our interventions are made.

experimental manipulation. Importantly, all of the students receive the same platform throughout, so the platform itself is held constant across different manipulations. For the pilot study, the class starts in the control condition, in which assignments are presented in a conventional, digitized form. The whole class then moves together into the gamified condition, in which the same types of assignments are presented in a gameful form, and subsequently into the coaching condition, which will make use of the same conventional assignments but with certain modifications surrounding them (see Figure 4). Eventually, the class will work with a combined condition we consider gamified coaching. The platform itself is therefore held constant and is not confounded with the manipulation.

E2: Language course. Learners from various backgrounds enroll in a paid course at a language academy, taught by a teacher in order to learn a Zazakî dialect. Investment here is financial rather than academic, which we expect to produce a different commitment profile from *E1*. This environment already provides a small companion application supporting quiz-based practice alongside the course, which offers a natural site for our planned intervention.

E3: Learning application. The least constrained of the three environments in which users from various backgrounds can work towards a better proficiency of Northern or Central Kurdish. The application is free of charge, users choose which language to study and which components to interact with at any given moment, and participation can be abandoned at any point without consequences. This environment is entirely digital, which makes it easier to introduce our planned interventions, while we have to expect to see the highest attrition due to its unconstrained nature.

In collaboration with the developer, we are currently implemtenting the technical basis for users to get different roles and permissions assigned in order to use the application in different modes. Each mode will hold one of the planned experiment conditions for the users to use during language learning. The application has several gamification features, including experience points (XP), gems, hearts, daily goals, leaderboards, duels, streaks, and a shop. Which parts of the already existing gamification elements we keep and which we need to suppress in order to create a comparable control condition across environments is still object of active discussion.

4 Experimental Design

Across all three environments the study follows a common skeleton which includes one control group, one gamified treatment group, an agent-based treatment group, and a combination of gamified agent-based treatment group. Each group is measured with the same instruments before and after the intervention period.

In each environment, and in cooperation with the teaching or developing party, we introduce alternative conditions that vary the modality of the learning experience while holding the underlying learning content constant. We aim at four conditions per environment which we intend to create as comparable as possible considering the varying nature of each context. The first is the un-

Env.	Setting	Institutional pressure	Financial investment	Voluntariness	Content provider (Learning actor)	Delivery mode
E1	University module	High	Low	Low	Lecturer (Student)	Primarily in-person
E2	Language course	Medium	High / Paid	Medium	Teacher (Learner)	Mixed
E3	Learning application	Low	None / Free	High	Developer (User)	Fully digital

Table 1: Contextual differences across the three learning environments.

modified but digitalized activities, serving as control. The second is a gameful redesign of the same activities, targeting primarily extrinsic motivation through game design elements. The third introduces coaching, via an agent that accompanies learners over time and prompts changes in learning behavior, targeting self-regulation and thus primarily intrinsic motivation. The fourth and last condition combines the agent-based intervention with those gamification elements applied as part of the second condition. This design provides a way to disentangle the observed effects of gamification and agent-based interventions more clearly via a cross-comparison among all four settings.

The resulting design crosses three environments with four condition families, as depicted in Figure 1. Since the environments differ in ways we cannot control, we do not treat them as levels of a factor to be tested against one another but rather perceive each environment to support a within-environment comparison, and the cross-environment contrast to be interpreted qualitatively.

Considering the limited number of students in the first year, we intend to slightly adjust the execution during our initial pilot study. As described in section 3, we will have all students progress through a staggered setup in which everyone experiences the same condition at the same time and in which the described measurements will be done again at each transition between stages.

5 Procedure & Instruments

All groups are measured before and after the intervention period using the same instrument families, as well as when switching from one condition to another. We plan a language proficiency assessment at the start and at the end of the intervention period, and a smaller such assessment between condition intervals. In parallel, we aim to run initial and final questionnaires covering self-regulation, and a

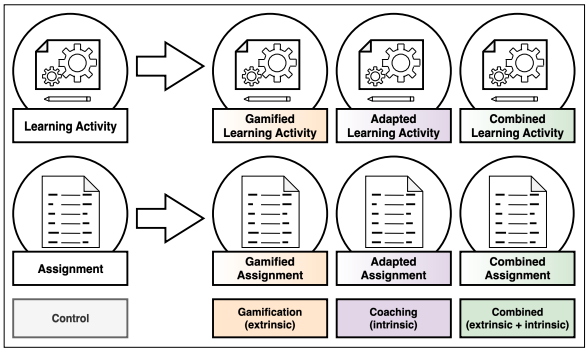


Figure 3: Interventions overview.

self-assessment survey addressing perceptions of gameful design. Since we will introduce digital platforms for serving the different conditions, we can log actual usage such as session count, time spent on task, and feature interactions. By pairing this telemetry with the self-report instruments we will be able to distinguish learners' reported engagement from their real engagement. Taken together, these assessments should allow us to characterise how different modalities affect language learning outcomes and learner experience, and to identify which combinations warrant further investigation.

Coaching Coaching utilizes a stage-based learning agent that supports students throughout the behavior change process to develop productive learning habits and metacognitive routines. It provides timely learning analytics, personalized guidance, and interactive prompts for goal setting, action, reflection, adaptation, and maintenance. In each behavior change stage, it will first provide a primary learning analytics, and then provide students' agency to choose other supporting analytics. The learning analytics could be descriptive, diagnostic, predictive, and prescriptive. During practice, it can also provide on-demand tutor support while keeping the learner focused on their longer-term learning routine. Its name, avatar, and parts of its visual

Gamification element	Role in learning activities	Example implementation	Taxonomy branch
Objectives	Define clear, achievable learning goals for each activity.	Missions, side-quests, milestones	Personal
Point	Provide immediate, quantifiable feedback for completing activities or performing successfully.	Earn experience points (XP)/points for correct answers or completed tasks	Performance
Progression	Make learners' progress toward goals visible over time.	Progress bars, steps, maps; completed/remaining activities	Performance
Acknowledgement	Recognize accumulated achievement and completion.	Badges, achievement markers, trophies	Performance

Table 2: Elements of the planned core gamification package, their roles in learning activities, and how they relate to Toda et al. (2019)'s gamification taxonomy.

styles can be customized by the students to accompany the students through their learning journey.

Interventions on Learner Activities The intervention families are instantiated separately in each environment, since the actors, the delivery channel, and the degree of control over learner activities all differ. In each case the responsible party, that is the lecturer in *E1*, the teacher in *E2*, and the developer in *E3*, retains authorship of the learning content, while the redesign concerns how that content is presented. The redesigns and intervening modifications of the learning material are derived in a collaborative co-creation process together with the researchers. Figure 3 provides an initial overview of the planned interventions, while Figure 2 contrasts the three instantiations.

For the study, each environment will be redesigned around five core learner activities: Vocabulary, Grammar, Alphabet, Listening, and Dialogue. These cover the main forms of language learning across the three environments. The original content and goals will be kept, but the way activities are presented will be reorganized. A shared Core Gamification Package (see Table 2) runs through all three environments. Objectives provide learners with clear goals and a purpose to perform the required tasks. Points provide an extrinsic feedback to the user' actions. Progression provides an extrinsic guidance to the uses of their advance through the activities. Acknowledgement is a kind of extrinsic feedback that praises the players' specific set of actions (Toda et al., 2019). The four elements will stay the same across environments; only their implementation will be adapted to each environment.

Ethics and consent. Aligning with work from participatory research involving native speakers of low-resource languages (Millour, 2019), we base our work on voluntary crowd-sourcing for ethical reasons as well as to ensure quality (Fort et al., 2011), and also for practical reasons of gaining access to the participants (Callison-Burch and Dredze, 2010) at all.

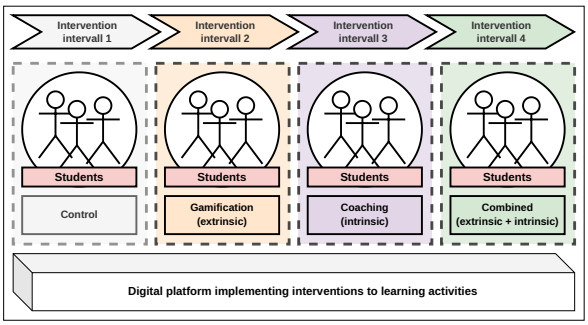


Figure 4: Staged condition sequence where students progress in the shown order during initial pilot study.

6 Conclusion & Outlook

We are currently setting up the experiment start of the first learning environment *E1* (university module) which will run until the end of the year Figure 4. Alongside, we aim to initiate the experiments in the other two environments (language course and learning application) which are currently being designed in more detail.

At the time of writing, we are working in close collaboration with the stakeholders (teaching and developing parties) of the three environments described in this project outline. We are looking for potential sources of funding to support development and execution of the planned later stages of this research work. The prototype which we will use during the earlier pilot study is close to deployment. Together with the Chinese lecturer, we are in the process of first digitizing the assignments for

the first group of students who just entered university and then to introduce our different sets of interventions into their coursework one after another. Thereby, this pilot study allows us to run the first iteration of experiments in the fixed sequence described in section 3 and shown in Figure 4.

Depending on the pace at which we achieve progress, we will then shift our efforts targeting the other two environments (first *E3*, followed by *E2*) from design to implementation and finally execution in order to initiate new experiment iterations in sequence or even in parallel to *E1*. We hope to gain many valuable insights from the initial pilot study as well as from discussing this work at the Multi-LLL workshop to best inform our work on and during the later stages of this research experiment.

7 Limitations

The following describes the identified limitations of this work which should be considered carefully and handled responsibly.

Lack of funding. The same economic challenges which language learners often face, cause research to struggle when securing funding for this kind of research. We rely on voluntary crowdsourcing and have to accept the resulting small and self-selected samples sizes.

Few participants. As a consequence, the group of each condition is bound to be small and potential attrition (e.g. a student dropping out of university) may severely affect the comparability of the final results. While the expected dropout differs across environments and might be a limitation as well as insightful outcomes too, we opt to run a slightly modified pilot study to face this risk.

Cross-sectional self-reported perceptions Self-reporting on motivation and self-regulation is vulnerable to social desirability bias, which is most likely to affect *E1* where the lecturer who delivers the intervention is also the one who assigns grades to the students in the end of a term. In the scope of our intended pilot study, this limitation slightly changes into "repeated self-reported perception", where the same learners now report on each of the four stages in sequence, which may affect their later ratings due to how they rated earlier stages, rather than reflecting each condition independently.

Only few pre- or post-test Only relying on single measurements may not be enough the detect short-lived novelty excitement about a new platform or modality. For this, a delayed follow-up could detect how earlier observed motivational gains slowly evaporate after the novelty of something like a gamified interface wears off. This plays into our somewhat ambitious intention of setting the experiments up such that they can run multiple years in succession.

No causal claims Since we do not intend to treat the three environments as levels of one factor due to how different they are, research question 3 can only be answered qualitatively. Within the environment during our pilot study, the fixed and uncounterbalanced order of the four stages means that differences between stages are also confounded with the passage of time. As learners mature and gain language proficiency which they carry over from earlier stages, any observed stage-to-stage differences cannot clearly be attributed to a given condition in isolation.

Possible recall bias and short or uneven exposure The timing and extent of intervention actually received may vary among participants. In environment *E3*, the learning application, participants can freely choose their learning content and start or stop at any time. Even when paticipants are assigned to the same conditon, the degree to which they are actually exposed to the intervention may differ.

Limited generalizability across Kurdish varieties and interface-language groups Findings from one variety-learner combination may not transfer well to another, which is something that has to be carefully considered when reporting results in later stages of the experiment.

Instrument validity across cultural and linguistic contexts The self-regulation and motivation instruments we intend to apply are drawn largely from Western, well-resourced educational research. Their validity for Kurdish-variety learners, or for constructs that are translated into Kurdish, Chinese, or other interface languages, is not established at this point and may not transfer very well.

Declaration on Generative AI

During the preparation of this work, Asta[1] was used to assist with literature search and to identify potentially relevant publications. Grammarly[2] was used to check grammar and improve the clarity of sentences. The first technical prototype of the digital platform for delivering the different conditions to the students is developed with coding-support by Claude[3]. For resolving LaTeX-related layout issues during the creation of this document, Grok[4] provided useful code-snippets.

Acknowledgements

Christian gratefully acknowledges financial support from GraduSaar, University of Saarland.

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