

An Analysis of Applying the Short Bridge Method to Digital Education

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Abstract. This work seeks to build a new kind of classroom experience by rethinking how educational content is currently transmitted and consumed at schools. This work presents the results of applying the Short Bridge Method in the education context. We evaluate how this approach contributes to the class composition process by providing tools that support educators and school administrators to plan courses aligned with students' necessities and learning pace. We present our methodology to identify the work flows and artifacts that impact the class composition activities to support educators and school administrators for personalized learning environments. The results allowed us to understand and map the teacher's behavior during class preparation and define a set of practices to be incorporate in class composition software.

1 Introduction

A real improvement in worldwide levels of schooling can be perceived in the expected decrease of the number of people without formal education: 12% in 2010 to 3% in 2050. Together with this, we can observe the fast spread of broadband mobile internet and the improvement of information access for all citizens, regardless their origin [4].

In addition, the constant behavior changes between generations are transforming the main kind of knowledge acquisition and also opening space for novel education methodologies that became more individualized, customized and interactive. This new approach increases the teachers work, and even causes uncomfortable situations related to a misconception that technologies will replace traditional teachers.

Teachers are under information overload whilst selecting learning objects from the growing source of Open Educational Resources like YouTube for schools, Khan Academy and MIT OpenCourseWare. These professionals face the challenge of selecting the objects that are both aligned with their preferences and they believe will help improving learning performance and student engagement.

Dealing with educational issues teachers need to follow growing content demand, deal with the school and students technological choices, and understand the dynamics and pedagogical aspects of digital educational resources.

Faced with those endeavors, some research questions arose: are the present class composing and performance processes the same since new medias emerged?

How is the Teacher class composition process facing information overload? Can smart technological educational tools help Teachers in this aspect?

An alternative to cope with those research questions would be the use of the Bridge Method. Initially developed in 1998 by Dayton et al. [1] and further quoted by many GUI researches, the Bridge method aims to bring knowledge about how to go from User Requirements to User Interface in a interactive system — how to bridge the gap. Translating the subjects mental models in a flowchart, the method also brings a consensual interaction map considering all stakeholders and important touch points. The Authors recommendation about the activity duration however was too long which frustrated their wider use. In 2004 Zilse and Moraes [6] suggested that a shorter version of the original method could be applied to any interactive systems and also any project where specific user interactions (virtual or physical) should be mapped in blueprints, The Short Bridge Method. Focusing on simple, viable, and feasible interactions between participants during a period together the method helps to identify user flows, bottlenecks and features.

Since then the method has been applied routinely to map the user desired actions in User Experience Design processes. For instance, the process would allow to identify the Teachers journey map, from the class composition to the class review, highlighting important issues. To validate the Short Bridges findings we analyze a case study, part of a Digital Teaching Platform (DTP), a Brazilian Samsung Research Institute ongoing project [3].

As a result, we modeled the Teachers work with consequent optimization of operational costs and betterment of education process. We believe that the application of the proposed method will improve the user experience by translating the teacher mental models in applied educational solutions. Also, we contributed with to help teachers to rethink the classroom as whole. Focusing not just in the content but how it is transmitted and consumed by the students, leading to pedagogical practices that contributes with class composition and stimulate students knowledge sharing. This paper is organized as following: (1) the Short Bridge method application to the understanding and mapping of the teachers mental model related to class composition processes within the information overload context; (2) the methods outputs analysis; (3) evaluation and validation of these outputs in the real case study and; (4) the Results and outcomes for further studies propositions.

2 Short Bridge Method

2.1 Preliminaries

Based on The Bridge method, the Short Bridge version is also an user centered method, focused in potential users (including his particulars, tasks and environment), who's the job must be supported by an application [1]. The main attribute of this method is to clarify the user interface by the user requirements detailed by the main users, bridging the gap between both. In this shorter approach we established application like any product or solution interacted by users,

and the interface like any touch point between the user and referred application. Ultimately, the method is a collaborative one that purposes to specify the user experience itself in a top-down point of view (user experience and interaction) [5].

2.2 Application

The short version of The Bridge Method workshop, originally played from 3 to 7 workshops days, is organized to range from 2 to 6 h, according to the complexity of the theme, in a sharper point of view. The necessary materials are A4 sheets, pencils, a large board or big sheets (where the user flow will be drawn), colorful Post-its and boards pens. About the subjects, the creators of The Bridge method recommend five participants collaborating with their expertise in a rich discussion, bringing solutions to challenges presented. The subjects were chosen by the following criteria:

- two different skilled users in distinct subject relevant axis of experience: two teachers were invited, one specialist in Learning and planning Methods and a post-graduation teacher;
- one UX Designer or HCI Usability professional: we chose the first;
- one Developer or Computer Scientist: chosen an expert;
- one System Engineering or Technical Documenter: chosen first.

The Short Bridge Method should follow the 4 steps in the workshop plus one to Report (see Fig. 1), where: Step 1, Actions (16 % of workshop time) is a warming moment and when each participant list his personal relevant and desired actions for the theme and begins to understand the user’s actions at all from the other participants point of view; Step 2, Tasks (34 % of workshop time) is when users helped by others participants express the actions in tasks flows; Step 3, Features (34 % of workshop time) is when some solutions for the found problems means features (task objects); Step 4, Validation (16 % of workshop time), a kind of usability test; and finally the Short Bridge method additional Step +1, Report with the detailed outputs.

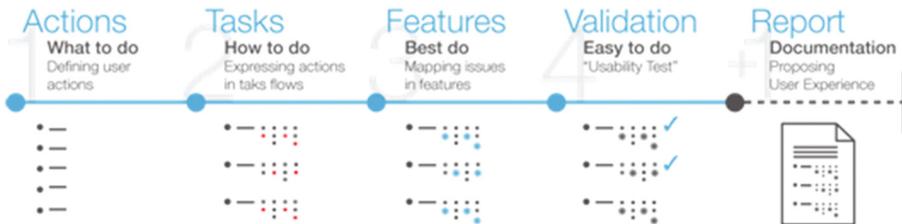


Fig. 1. The 4+1 steps of the workshop for applying the Short Bridge method

2.3 Outputs

With the application of the Short Bridge method we could map the teachers mental model for class composition activities and build a flow chart encompassing the process. By its application results, we could confirm the interconnection between the class composition and class execution activities, so both were detailed in this study. Organizing and stimulating a guided discussion between the participants, it was possible to identify the main actors of each phase of the process and map the related and desired stages. Also we were able to specify some features and roles for each actor. Such outputs can be used for any system development that intends to build solutions for this domain. To present the results, as recommended by the shorter version presented, we used the flow chart based on the Garrett visual vocabulary [2]. It shows a process summary, focusing to the actions-key, simplifying the final result.

As presented in the user flow chart of Fig. 2, the Class Building Process consists basically in two phases and 6 key actions (hexagonal shapes):

- Class Composition Phase 1 composed by (A) Class Script Build, (B) Class Planning and Execution of Lessons and (C) Emulate and Test Class;
- Class Execution Phase 2 composed by (D) Provide Class; 5, Share Class; and (E) Class Evaluation by Feedbacks.

The main actors are: Teacher, Academic Coordinator and Academic Platform.

The first phase, Class Composition, is when Teacher prepares his classes or the whole class period. His/Her work starts with the Classes Script build or review (A). Class Planning and Execution of Lessons (B) is a dynamic action composed by the search and compilation of physical or digital contents and resources, typically the educational objects, tailored to recovered, copied or new lessons and activities. This is the heaviest phase, when the teacher searches for examples, activities and media elements like videos, digital exercises or graphics to enhance the class content. After finishes a class composition, frequently the Teacher emulates and tests his class (C) to verify the consistency, deepness, and time, to evaluate if it is appropriated for the students profile. It is very common Teacher tests the learning object he/she is adding doing essays to verify the validity of it. The evaluation of those results leads to the review of lessons, educational contents, new assessments and even, a re-planning of the class. Within the participants discussions we identified five features often used by Teacher when playing the Class Planning and Execution of Lessons action (B): (1) Adds/Review content items; (2) Records Audio/Video by him/herself, something or event; (3) Adds Links to complementary contents in books, handouts, internet or applications; (4) Integrate Medias like videos, games, labs or activities; and (5) Combine skills and abilities that will rank the class at all over an Academic Platform. All of those features were recommendations based on the Teachers point of view based on their current experience with unintegrated software solutions to do so. Today this Teacher deals with many sources and kinds of information causing an overload to manage. The (B) action Class Composition and Execution of Lessons is the hardest of all the building class process.

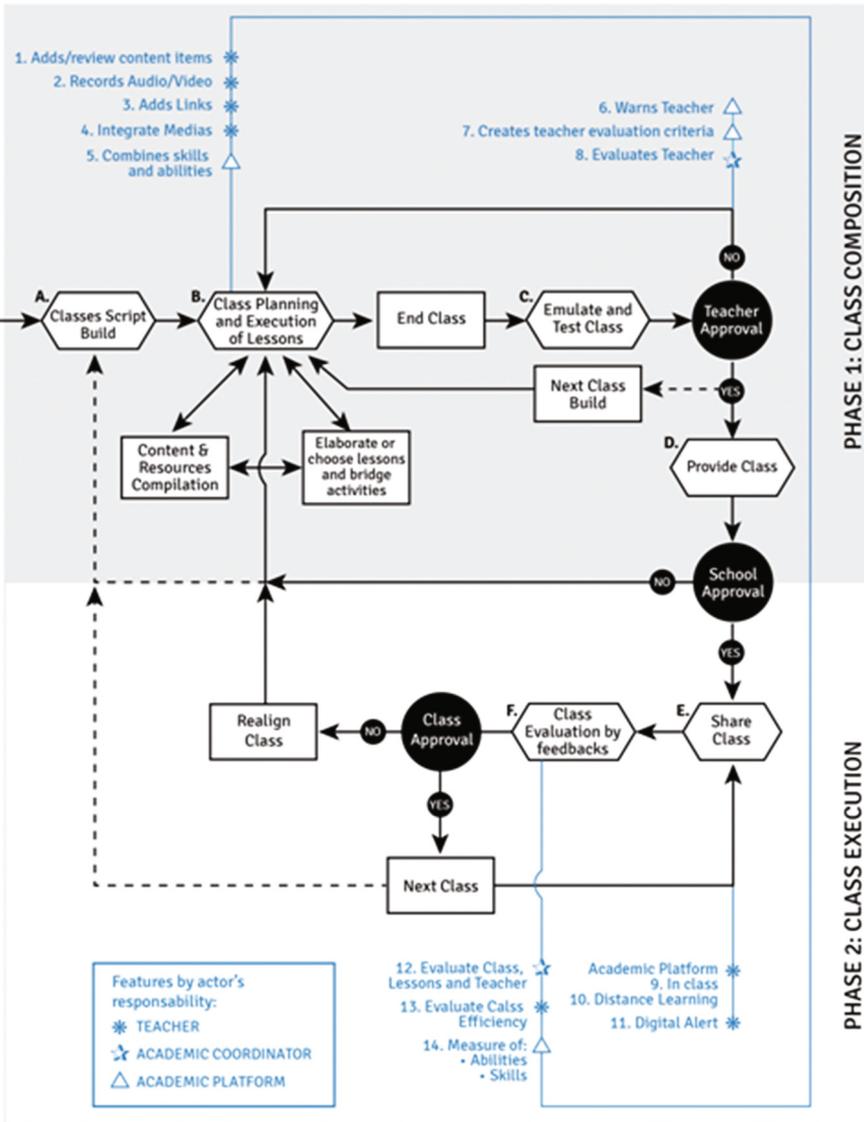


Fig. 2. Process flow chart of the full process for classroom education

After the class or all periods classes were done Teacher shares it with school (D, Provide Class) to a board approval. At this step it was identified new features: (6) Warns Teacher about approval or not; (7) Creates Teacher evaluation criteria; and (8) Evaluates Teacher. All of them addressed to School management and its mapped actors (Academic Coordinator and Platform) allowing evaluation just in time.

Once approved by the School, Teacher goes to the Class Execution second phase. He/She teaches In Class or Distance Learning (E, Share Class). Sometimes he/she anticipates digital alert with class topics to students by intranet, e-mail, Facebook or Whatsapp (features 9, 10 and 11 also mapped and highlighted in the Flowchart). The Teacher always gets feedback from students by comments, behaviors, assessments or questions during the class time and from others schools educators (F, Class Evaluation by feedbacks). The related features of this action are: (12) Evaluate Class, Lessons and Teacher, assigned to the Academic Coordinator; (13) Evaluate Class Efficiency, assigned to the Teacher; and (14) Measure of acquired abilities and skills, assigned to the Academic Platform. This information will form the basis of his/her knowledge about the class students and will be useful for future classes reviews or even for new ones. By this reason the features mapped on this action (F) are linked to the features mapped on the action (B). Without a consistent Class Evaluation by feedbacks the Class Composition and Execution of Lessons (action B) quality is compromised.

3 Evaluation

We evaluated the flow chart of Fig. 2 in two phases, corresponding to the two phases of digital education: class preparation and class execution. The evaluation of phase 1 was performed during a set of field trials, with the support of a prototype DTP specifically designed to support the highlighted activities. Our results were obtained due to a collaboration with two teachers at public high schools in Manaus, Brazil, to create digital classroom content that were complementary to their regular mathematics classes.

3.1 Case Study

Because the user interface of the DTP Composer element was still in development, the first phase was not executed directly on the platform, but rather the Teachers indicated what content they wanted to use, and we manually composed the classroom material for use on the platform. In this manner, the Teachers created their class plan and content, and used us as an interface with the software platform. In particular, the Teachers searched for online videos, and used these, in combination with educative slides to compose most of their material. They further used exercises based on the book material their school uses, and indicated interactive content that the book publisher makes available to the schools. We composed an electronic book integrating all these materials, or if unavailable, substituting them with equivalent content. This, in turn, was validated by the Teachers, who suggested further changes. This corresponds with the cycles we see in phase 1 of the flow chart of Fig. 2, where we expected various back-and-forth discussions between class planning, content compilation and Teacher/school approval. However, the main focus of our evaluation was on the class execution process, which we could evaluate more rigorously due to the prototype software being ready for use in the classroom.

The class execution phase was evaluated in five classes in two public high schools in Manaus, with in total 180 students participating in the classes. In the classes, both the teacher and all the students used the tablet with the DTP Content Player prototype that we developed in accordance with the output from the Short Bridge method. We evaluated student and teacher satisfaction with the prototype using a satisfaction survey during the class, and interviews after the classes.

3.2 Results

The case study reinforces that the application of methods that brings people to a co-creation processes is the better way to achieve natural and easy solutions. These kinds of process should be the basis of any digital and interactive application that intends to help people. And the Short Bridge Method applies well as a way to understand the mental model of the target system users.

The field trials, allowed us to identify that educational applications must focus on the “chain of teaching”; considering the administrative staff (pedagogical designers and directors), the school pedagogical plan, the class itself and the post-class evaluation. The sequence and correlation between the actions and system’s functionalities should be oriented to meet these stakeholders.

The Class Planning and Execution of Lessons could be confirmed as the harder action of the Class Building Process. Empowering the teacher during their class composition activities is crucial, specially when considering this bottleneck. Many teachers spend too much time searching and tailoring educational contents. One teacher remarked that “if there are 10 ways to resolve a question, I will teach all of them. I think that each person has his way to learn and will choose the best manner to do that.” Their time is limited, and it would be interesting for them to focus on pedagogical alternatives that could improve the content assimilation by the students.

The Short Bridge method as a tool to identify the user experience involved in schools allowed us to get insights regarding the design and development of seamless educational solutions for school environments.

4 Conclusion

The Short Bridge collaborative method, with two different skilled Teachers participation and engagement, brings knowledge about the user journey and experience very relevant for the Digital Platform development. Even considering the results related and dependent of them domain, it was possible to confirm the Teacher information overload perception highlighting the harder action in the Class Building Process: the Teacher Class Planning and Execution of Lessons. Motivated to help teachers to rethink the classroom as whole, the focus on this action allow us to propose a virtual environment where the mapped features could be easily controlled (Fig. 3). We hope so to support Teachers to plan courses aligned with students’ necessities and learning pace minimizing his/her overload while the activities could be easily performed.



Fig. 3. Wireframe of the Composition tool for completing the action Class Planning and Execution of Lessons (B)

The User Flow Chart represent the actions of the Teacher taking into account other stakeholders (called actors) pointed by the main participants. They are essential for the perfect execution of the Building Classes Process. The features pointed are also relevant but should be tested in a more accurate and focused research.

Although the Teacher Planning Class Process use case was a specific topic, we can verify that the Short Bridge Method application works to any interactive processes. The focus is the user action and his necessities for the studied system. The attributes and features are not protagonists. The purpose of the method is to provide a better experience for the user to achieve a goal. Further studies should be done for better validation of the Class Composition first phase (actions A to D) with new experiments in a real case field trial.

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