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Abstract: This paper describes a study where design-based research (DBR) is used as a framework for the design and implementation of an online community of foreign language learners, in the context of learning Italian as a second language at university. An online community of practice that included a group of second and third year students of Italian, and seven native speakers facilitators, was developed and implemented according to the principles that guide community development (Lave and Wenger, 1991; Wenger, 1998). For one semester community members interacted and collaborated with each other through the communication tools of an online learning management system with the objective of completing two authentic activities that involved planning and organising a trip to Australia and Italy, and to develop a comprehensive itinerary and travel guide. This paper describes the four phases of this study and the methodologies of each phase according to the model of DBR outlined by Reeves (2006).

Design-based research and educational technology

Ann Brown (1992) and Allan Collins (1992) introduced the term *design experiments* or design-based research (DBR) to refer to the study of learning in context through the design and development of instructional strategies and innovative educational environment based on the theoretical principles derived from prior research. Later, Reeves (2000; 2006) summarised the main characteristics of DBR, based on the original studies carried out by Brown (1992) and Collins (1992) and outlined a model that illustrates the four phases of DBR.

As Reeves (2000) indicates, design-based research (DBR) has in the past also been defined as *formative research* (Newman, 1990), *design experiments* (Brown, 1992; Collins, 1992), *development research* (van den Akker, 1999; Reeves, 2000) or *design research* (van den Akker, Gravemeijer, McKenney, & Nieveen, 2006). The Design-Based Research Collective (2003) has recently agreed on the choice of the name *design-based research* over the previously used terms. According to these authors, this term refers to the combination of empirical research carried out in an educational context and the design driven by theory of innovative learning environments (The Design-Based Research Collective, 2003).

Researchers agree that DBR should have a strong theoretical foundation (Reeves, 2000; The Design-Based Research Collective, 2003; diSessa & Cobb, 2004; Collins, et al., 2004; Wang & Hannafin, 2005; van den Akker, Gravemeijer, McKenney, & Nieveen, 2006). It should be based on and benefit from the theoretical principles derived from prior research, and should address theoretical questions and issues. The Design-Based Research Collective argued that design-based research can contribute to the creation and extension

of knowledge about developing, implementing and sustaining innovative learning environments in an educational context in order to 'produce meaningful change in contexts of practice' (The Design-Based Research Collective, 2003, p. 6). Wang and Hannafin (2005) have defined DBR as: 'a systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories.' (p. 6)

Wang and Hannafin (2005, p. 7) have outlined five main characteristics of design-based research based on previous studies. Design-based research is:

1. *Pragmatic:* DBR has a practical goal, and refines both theory and practice.
2. *Grounded:* Design is driven by theory and is grounded in relevant research, theory and practice. Theory is the foundation of DBR but is also constantly developed and elaborated throughout the research process. *Grounded* also indicates that DBR takes place in real-world contexts where participants have the opportunity to communicate and interact socially with each other.
3. *Interactive, iterative and flexible:* Researchers and practitioners *interact* and collaborate with each other to develop solutions to address complex problems. DBR processes are continuously developed and refined through an *iterative* cycle of analysis, design, implementation and redesign. DBR processes are *flexible* and it is always possible to implement changes when necessary.
4. *Integrative:* DBR draws from a variety of approaches and uses a variety of research methods. During the different phases of DBR, methods vary as the focus of the research changes and develops.
5. *Contextual:* Research results are linked with the design process and with the particular context in which research is conducted. The aim of DBR should be not only to design and test a particular intervention but also to understand how and why an intervention works within the particular context in which it is implemented.

In a recent contribution, Reeves (2006) exemplified the differences between predictive research conducted with traditional empirical goals, and design based research inspired by development goals, in the following way:
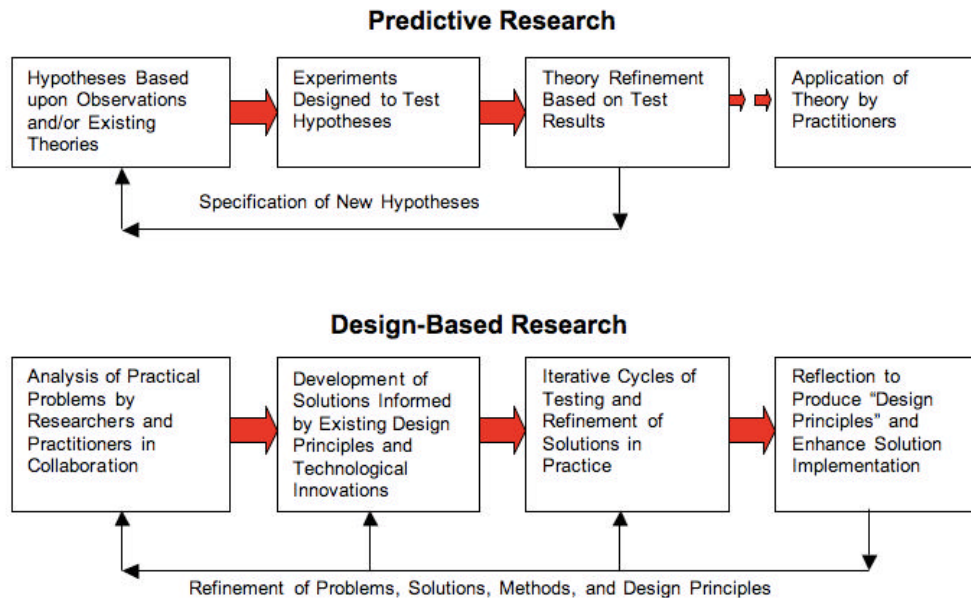

Figure 1: Predictive and design-based research approaches in educational technology research (Reeves, 2006)

According to Reeves (2006) design-based research aims at addressing complex problems in a real context in collaboration with practitioners, developing and implementing plausible solutions informed by existing design principles and technology-based innovations to these complex problems, conducting rigorous and reflective enquiry to test and refine the innovative learning environment developed and to define new design principles that could guide other practitioners interested in solving similar problems within their educational context and could inform future decisions.

Learning Italian in a community of learners

This paper describes a study that attempts to address the practical problem of lack of authentic exposure to a target language through meaningful and authentic communication with native speakers within the context of a foreign language classroom. The solution proposed involves developing and implementing an online community of learners to enable students' interaction through participation in authentic activities in a learner-centred environment. The use of design-based research was considered most suitable for the investigation of the problem and the online learning environment of this study, firstly, because of its iterative nature and secondly because it emphasises the close relationship between research, design and practice. The study was conducted in four phases and was guided by the model of design-based research outlined by Reeves (2006).

Phase 1: Analysis of practical problems by researchers and practitioners in collaboration

The initial phase of the project consisted of identifying and analysing a significant educational problem within the context of a foreign language university classroom, which was the lack of authentic exposure to the target language through meaningful and authentic interaction with native speakers of the language. In this initial phase, a number of research studies that have attempted to address this problem and have provided successful solutions, have been examined and analysed. Specific examples of case studies that have implemented a community of practice approach for collaborative learning in an online environment have been described and compared in order to evaluate the main benefits and problems related to those designs.

Phase 2: Development of solutions informed by existing design principles and technological innovations

The second phase of the study involved the development of possible solutions to the initial problem as defined in Phase 1 of the study. This phase was informed by principles that guide the development of a community of practice as indicated in the relevant literature (Lave & Wenger, 1991; Wenger, 1998) and the use of authentic and situated activities (Brown, Collins & Duguid, 1989; Herrington & Oliver, 2000; Herrington & Herrington, 2006). During this phase an online learning environment was designed and developed using the community of practice approach proposed by Lave and Wenger (1991). A learning management system was used to allow the members of the online community to interact and collaborate with each other through a number of online communication tools and resources. These tools included online threaded discussion forums, email and chat. All the communication within the online community took place in written mode.

Two complex authentic activities were designed to incorporate the defining characteristics of authentic tasks. The first activity required students to plan and organise a trip to Australia for a group of Italian university students, and to develop an itinerary and a comprehensive travel guide. The second activity required students to also plan and organise a trip, this time to Italy. In order to complete each activity, learners were required to work collaboratively and interact with each other, and with a group of Italian native speaker facilitators, using the communication tools provided in the course website and relevant authentic material. Learners were required to make use of a wide range of resources, including expert community members, and to draw on knowledge from other subject areas in order to create a final product,

which was the result of their collaborative efforts and was shared among community members. This phase was framed by the constructivist view that language learners should develop and extend their understanding of the conventions of language use by engaging in the kinds of authentic activities likely to be found in real world contexts (Lightbrown & Spada, 1999; Warschauer, 2000; Lee, 2004). During this phase, the native speakers or expert community members acted as facilitators and provided learners with the appropriate scaffolding to assist them completing the tasks.

Phase 3: Iterative cycles of testing and refinement of solutions in practice

The third phase of the research involved the implementation of the solutions proposed in the second phase of the study. During this phase, two iterative cycles of testing and refinement of the solutions proposed were implemented within the specific context of a second and third year Italian language university classroom. Data were collected, analysed and evaluated during and after each of the two subsequent iterations. A triangulation of data was used to determine the success of the design. Data were collected through individual and focus group interviews with students and through individual interviews with the facilitators as well as through recording, note taking and observation of the classes. Several documents and artefacts were also collected and included in this phase, such as a questionnaire to obtain background information from the students, messages posted to the discussion forum, online interactions between participants and email messages. Students' learning portfolio assignments and the final products of their activities were also collected and analysed.

The first iteration
The first iteration of the study was conducted in the second semester of 2006. The participants were 13 second-year and 3 third-year students of Italian at the University of Wollongong, four Italian native-speaker facilitators and the researcher, who was also the class teacher. Students were required to complete the first of the two activities described in phase two of the study over the first six weeks of the semester, and to collaborate and communicate with other community members both online and face-to-face. This first iteration was conducted to determine the effectiveness of the online learning environment developed, and to identify any issues or problems related to the design of the authentic activity, the presence of the native speakers facilitators, the collaborative work among community members and the technology used to support this collaboration. The first iteration was also undertaken to provide data to assist with the refinement of the second iterative cycle of the study.

In Week 1 of the study, students were introduced to the learning management system to be used in order to complete the collaborative activities during the course of the semester. The first activity—to plan and organise a trip to Australia for visiting Italian students —required students to make choices as to how they would accomplish the finished product. No attempt was made to simplify the process with step-by-step instructions. Students were asked to divide themselves into small collaborative groups, and each group was assigned to a native speaker facilitator who was available for the duration of the task to assist them and provide feedback and support as required. In order to complete the task and develop a final product, students were required to negotiate their roles and responsibilities within the individual groups and also among the different groups in the class. The activity had to be carried out entirely in the target language and students were required to use the online resources provided in the website to communicate their ideas with the other members of the virtual community and with the facilitators. Students were given the choice of the form of the final product of the project, depending on their preferences and abilities. The teacher provided students with a number of ideas and suggestions, such as developing a web page or website, creating a video segment or a power point presentation, or producing a guidebook or brochure. The class had five weeks to complete the activity and in week seven of the semester each group had to present the final product of their work to the rest of the class.

During the course of the first iteration, several data collection techniques were employed. Recording, note taking and class observation were the primary techniques. Focus group interviews with the students were also conducted and several documents and artefacts were collected, such as messages posted to the

discussion forum, online interactions and email messages, learning portfolio assignments and the final products of the activity. The data analysis began at the commencement of the data collection process.

Findings of the first iterative cycle
The analysis of the data collected during and after the first iterative cycle of the study revealed a number of problems that needed to be addressed before initiating the second iteration. The changes related to the presence of the facilitators involved in the study, the number and proficiency level of students in the collaborative groups, the level of support provided for the authentic activity and the use of some of the communication tools of the website. All of the problems encountered during the first iteration were addressed in the learning environment before the commencement of the second cycle of the study.

The second iteration
The second iteration of the study was conducted from week eight to week thirteen of the second semester of the same Italian language subject. Two of the four facilitators who participated in the first iteration also took part in the second cycle of the study. Three new facilitators were invited to participate in the second cycle. Students were required to complete the second of the two activities described in phase two of the study, over the last six weeks of the semester and to collaborate and communicate with other community members online and face-to-face, as they did during the first iteration.

The second task required learners to plan and organise a trip to Italy for the students in the class and to develop an itinerary and a comprehensive travel guide. As with the first task, minimal instruction was given to the students and they were required to communicate with other community members through the online resources provided, and to develop the final product. The activity had to be carried out in the target language and to be completed over a period of five weeks. For the second iteration, students were given the option of changing the groups' composition of the first cycle if they wished to do so, and each group was assigned to a different facilitator. The teacher conducted all the lessons and provided students with continuous support and feedback over the period of the study. As with the first iteration, recording, note taking and class observation were the primary data collected. At the conclusion of the cycle individual interviews with the students and with the facilitators were conducted, and a questionnaire to obtain background information was completed by the participating students at the time of the interview. Several documents (messages posted to the discussion forum, online interactions and email messages between participants) and artefacts (learning portfolio assignments and final products of students collaborative work) were also collected.

Findings of the second iterative cycle
The data collected during and after the second iterative cycle of the study is still in the process of being analysed. From a preliminary analysis of the data, a number of themes and issues have emerged that have implications for refining the design and implementation of the online learning environment. Generally the participants involved in the study commented very positively on the type of authentic activities designed and also on the opportunity to interact and collaborate with other community members through the online communication tools provided in the course website. One theme that has emerged from the analysis of the data related to the type of support and scaffolding provided by the facilitators. A number of students suggested that the type of assistance and feedback provided by the facilitators could focus more specifically on the linguistic aspect of the communication rather than on its content. Another theme that has emerged related to the amount of time required for completing the activity. Several students interviewed noted that the assigned task was very demanding in terms of time and effort involved in completing it. They commented that, despite having conducted the majority of their communication through the online resources of the website, they also needed to organise and attend a number of face-to-face meetings with the other members of their group. Students found this aspect of the work very time consuming. The issue of the type of support and scaffolding provided by the facilitators and the problem of time commitment would need to be considered and appropriately addressed when designing similar online learning environments.

Phase 4: Documentation and reflection to produce Design Principles

The final phase of the research is the documentation and reflection phase. In this phase the data collected in phase three of the research will be documented and reflected upon in order to produce a new set of design principles and guidelines that could be referred to and followed by other language instructors interested in addressing a similar problem within their specific educational context.

Conclusion

This paper described the design of a study that used design-based research to explore the design and implementation of an online community of learners in an Italian as a foreign language university class. The four phases of the study have been described and reflected upon according to Reeves' (2006) model of DBR. The main benefit of adopting DBR as a methodology for this study is that it has a pragmatic goal and aims at solving a practical educational problem through the development and implementation of an innovative intervention. A second benefit relates to the fact that the iterative nature of this approach allows the researcher to design and implement an online learning environment and to progressively test it and refine it through a number of successive implementations. In the particular context of this study, two successive iterations were conducted to test and refine the design of an online learning environment that provided learners of Italian with opportunities for authentic and meaningful communication with native speakers of the target language. It is hoped that the analysis of the research data will help to validate and improve the initial design and also to define a new set of design principles that could guide other language instructors in the task of designing and implementing a similar learning environment within their specific educational context.

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