An approach for Redesigning Learning Environments with Flow Theory

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Abstract: This paper proposes a framework that teachers and courseware designers will be able to utilize flow theory into their own teaching and learning settings, even if they have less knowledge about flow. There have been a number of researches about flow theory, including educational topics. Flow theory can be one of the powerful approaches to enhance motivational design for teachers and instructional designers. The matrix-based approach is proposed for covering more people to use this flow-based redesign framework, including introductory courseware of flow theory and checklists of compatibility with it, as well as sharing knowledge and experience in an open community. Further studies for improving this framework itself are also discussed.

INTRODUCTION

School education tends to depend on performance of teachers themselves. Teachers are expected to educate students who have abilities to lean, think, judge, and act by themselves as a whole individual. Therefore, it is very important to have teachers with a strong passion to teach, secure ability to teach, and comprehensive attractiveness as a human. These competences would be developed through trainings and experiences (MEXT, 2008). Recently, there have been many changes in Japanese educational system and its surroundings. Teacher training and qualification system has changed that teachers should update their certification every ten years. According to the government policy, many ICT facilities such as e-blackboard are getting into school classes year by year. As for students of junior high school in Japan, the ratio of students, who have positive affect toward mathematics and science, is lower than the global average in TIMSS survey (*TIMSS 2007 Technical Report*, 2008). In terms of science, there are 57 % of 4th graders choose “I strongly enjoy learning science”, however, in 8th grade, there are only 18%. This tendency is as same as in mathematics. Therefore, developing life-long learners who are intrinsically motivated and find learning enjoyable has been a major goal of education. So, motivational design would play an important role in educational research and practice. ARCS model of motivational design is a systematic model approach for designing motivational instruction (Keller, 1983).

When people concentrate much on some task and they forget time and enjoy it by themselves, they might get into optimal experiences, so called, flow state (Csikszentmihalyi, 1975). Recently, many researches about flow theory have been accomplished in various fields, such as psychology, business administration and education, etc. According to reviewing literature, flow theory has some potential of improving and enhancing motivational design in educational applications and e-learning environments (Chen, Wigand, & Nilan, 1999), (Keller, 2009). There have been many researches about flow theory or flow experience, which are applied to educational areas. For example, in the foreign language learning, “flow” does exist in the foreign language classroom and flow theory offers an interesting and useful framework for conceptualizing and evaluating language learning activities (Egbert, 2003). Another study shows that teachers of English as a Foreign Language (EFL) reported their flow experience during teaching (Tardy & Snyder, 2004). In the area of mathematics, some computer-based math applications can control some of the flow component and help students to increase flow experiences (Sedig, 2007). In an online course about management, the relationship between students’ flow experience and their learning outcomes is studied (Rossin, Ro, Klein, & Guo, 2009). Csikszentmihalyi has described flow experience as a magnet for learning, because sustainable flow experience requires new levels of challenges and skills (Csikszentmihalyi, 1997), so flow theory can be an effective approach for motivating both teachers/instructors and learners continuously.

A preliminary investigation was conducted about the relationship between teacher motivation and student motivation

(Atkinson, 2000). The number of samples was very limited, but it turned out that it seems to be some link between teacher motivation and student motivation. Another research shows that there is some relationship between students' engagement and motivation with their flow experience in e-learning settings (Rha, Williams, & Heo, 2005) (Pearce, 2005).

In order to improve the complex and difficult situations in educational areas, increasing motivation of both teachers and students can be one of the solutions for those. Besides, flow theory could give one perspective among many psychological/instructional design theories/practices. Flow theory has been studied much in the field of positive psychology, however, educational application and applicable areas of flow theory have not been studied so much yet. It is therefore the intention of this paper to propose a flow theory based redesigning framework for improving existing learning environments/courseware, to give some ideas/hints for teachers and courseware designers. Though flow theory is not so popular in educational fields, a comprehensive and formative approach is proposed in this paper. This includes an introductory courseware to know about flow theory, a checklist of flow theory compatibility, from novice to expert in their experience, and other activities.

FLOW-BASED REDESIGN

Framework

A framework for flow-based redesign is targeted for teachers and courseware designers, even if they have less knowledge of flow theory. The purpose of this framework is, in a straightforward manner, to increase and enhance motivation of teachers and courseware designers to improve their own teaching environments/resources or courseware design. As written in the above introduction, researches about flow theory/experience have been widely extending in various areas, but most teachers, instructors, and courseware designers have little knowledge about flow theory and flow experience at the moment. This framework tries to cover users from novice to expert experience in teaching and learning. According to the flow theory, there might be some possibilities for teachers and designers to improve their environments, materials, and courseware etc. This framework would show feasibilities of applications of flow theory in educational settings, applicable areas of topics, and keys to improve teaching and learning. Using this framework, many good practices, knowledge about flow theory, and hints to redesign learning environments would be collected and shared among many teachers, designers, and learners around the world.

Some teachers know flow theory much and others not. Besides, experience levels for teaching and courseware design differ greatly in individuals as well. Therefore, an online learning environment is proposed to cover a wide variety of users in order to know how to utilize and embed flow theory into their teaching/learning environments. A matrix-based approach is used so that users can choose appropriate activities according to their levels of knowledge of flow theory and experience of teaching by them. Figure 1 indicates a sample image of top selection screen that contains three levels of knowledge about flow theory and three levels of teaching and design experience. This matrix shows five different types of activities. In spite of teaching/designing experiences, users with less knowledge about flow theory may start from the introductory courseware of flow theory. The following subsection shows how this matrix works according to the experience levels of teaching or designing.

Novice user

If one is a novice in one's experience in teaching or courseware design and has less knowledge of flow theory, the first activity would be taking the introductory course about flow theory. After knowing and understanding about some of flow theory, users will get into the checklist of compatibility with flow theory in order to check what to the extent of compatibility with their own teaching/learning environments have and think and find some keys/ideas of improving their current situations. If users have some sort of knowledge about flow, they might skip some of the introductory course, and then, directly to get into cases of flow experience which include words from many professionals as well as teachers, who had flow experiences, in order to clarify their knowledge of flow, to have concrete concepts and images of flow experience, and to deepen their understanding of flow theory. Then, they will move to the checklist activity. If users have enough knowledge of flow theory, they may go directly to the checklist activity first. For novice users, a checklist is very long and informative with precise descriptions of each item of the checklist. As an increase of the experience level, the length and the elaborateness of the checklist would be getting shorter and simpler.

Intermediate user
If one is intermediate in one's experience in teaching and designing, and has less knowledge of flow theory, the first activity would be also taking the introductory course about flow theory like a novice user. After knowing about flow theory, users will get into the checklist of compatibility with flow theory as same as a novice user. If users have some knowledge about flow theory, they might skip the entire introductory course, and then, directly to go to the checklist activity. If users have enough knowledge of flow, they will go to the checklist activity, but the appearance of the checklist is different from that of for users with average knowledge. The checklist for users with fair knowledge is very long and informative with precise descriptions of each item of the checklist like a novice user; however, the checklist for users with enough knowledge about flow does not include any precise description yet.

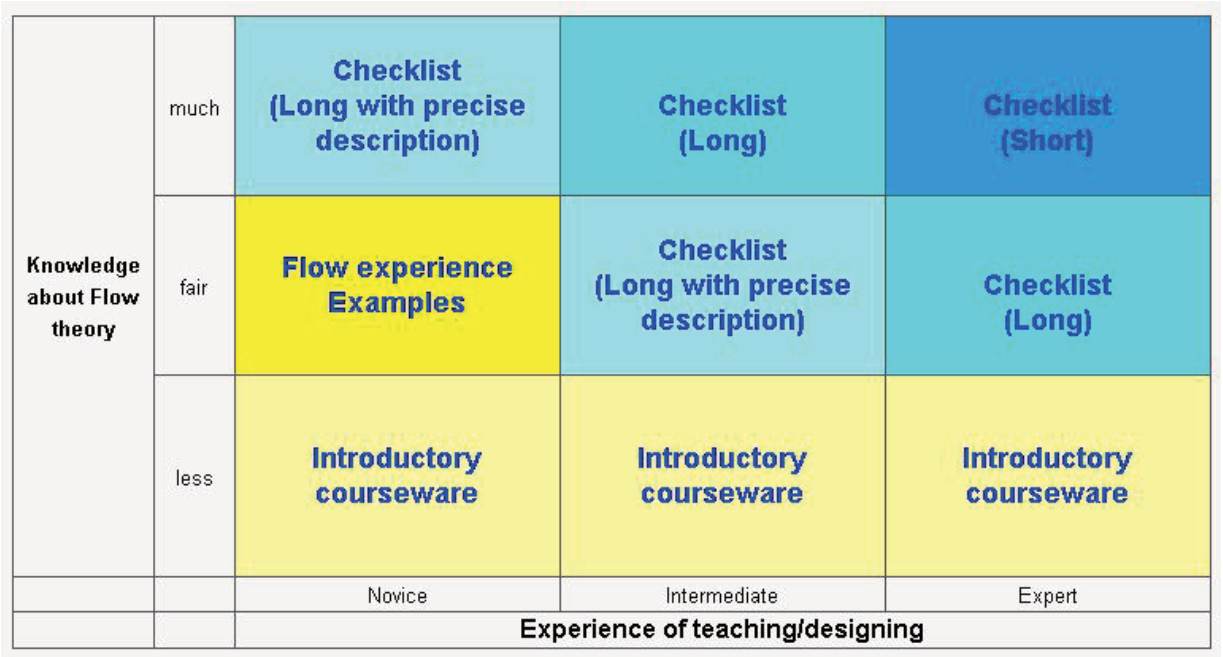

Figure 1. *Top Screen Image of a Flow-based Redesign Site*

Expert user
If one is expert in one's experience and has less knowledge of flow theory, the first activity would be taking the introductory course like novice and intermediate users. After knowing about flow theory, users will get into the long checklist activity. If users have some sort of knowledge about flow, they might skip the entire introductory course, and then, directly to go to the checklist without precise description. If they have enough knowledge of flow, they will go to a simple checklist. The checklist is very short and includes only essentials that are written in somehow abstract expression.

Design features of this approach
Some people in educational fields have got the word of "flow", but they have less experience to improve their teaching/learning environment with the flow theory. Some have known it much and others not. Besides, experience levels for teaching or learning materials differ as well. Therefore, an online learning environment is proposed to know how to utilize and embed flow theory into learning environment, which is independent of users' knowledge of flow theory and experience in teaching and designing. Ideally, many steps or individually-adaptive learning material might be best environment in flow theory (Chen, 2007). A 3 by 3 matrix would be better solution for practical use and initial start of this approach. This approach does not limit each level to three. After some formative evaluation, a matrix could be bigger and smaller according to the usage and effectiveness of the number of levels. Because balance

between challenge and skill is one of the important components in flow experience, a 3 by 3 matrix is provided and learners have to choose which level to start this material by themselves. All activities would be up to users' choices. A sense of control is another component of flow experience.

The introductory courseware can be mandatory because flow-based approach is relatively new in educational applications and most teachers and courseware designers do not always have much information about flow-based redesign, though they might hear the word of "flow" or "zone" in the field of sport coaching. In this courseware, users learn not only definitions and flow experience cases, but also they write their own flow-like experiences and rate them by themselves in order to deepen their understandings of flow theory and to increase their involvement of this new flow-based redesign approach.

The checklist has several features. The initial checklist has been developed from many researches about flow theory (Csikszentmihalyi & Csikszentmihalyi, 1992) and flow state scale, which is a measurement criterion for flow experience (Jackson & Marsh, 1996) (Csikszentmihalyi, 1990). Some modification based on the applications to educational fields has been needed because most researches about flow state scale were conducted in sports and physical education. The appearance of checklist has also three types: a long list with precise description for novice, a long list without description for intermediate and very simple short list without any description for expert usage. A checking activity is conducted by users themselves. They rate each item after thinking whether their teaching and learning environments are compatible with each item and which level of the compatibility. Besides, a final task on the checklist activity should be to write down how to improve their issues/problems they have faced in terms of each check items, which has lower scored rated by them.

Another feature of this approach includes user history and database function. Users can track their history of activities that have done through this flow-based redesign approach. In this web site uses can share their flow experience and their solutions to improve their learning environments. Besides, this approach needs some feedback from users who wrote their plans of improvements. After their execution of the redesign practice, a feedback about their results is asked to upload. Was that successful or not? After certain period of time later, a system automatically ask users to input their feedbacks and if it did not work well, another solution or key points of their improvements are needed to be written in the flow-based redesign site.

The framework, including introductory courseware, checklists, database, and portal site, is designed to be very flexible and self-regulated so that learners have as much control and decision. Details in each activity may change according to ongoing formative evaluation and accumulative feedbacks from real usage of this system. Other activities can be added to some locations of the matrix and this matrix might be bigger or smaller according to formative evaluations or users' feedbacsk.

INTRODUCTORY COURSEWARE OF FLOW THEORY

Courseware features

There are four steps in this introductory courseware: to give definitions of "flow", to collect users' real flow experience, to give examples of flow experience in the literature, and to provide reflective activity about users' flow experience at the end. Users can skip the initial part of definitions if they already have some knowledge. Users' flow experiences are accumulated on the site, so they can be shared through the portal site. The second section is an activity that users would think and describe their personal flow experience and evaluate the depth of it by themselves. This is a mandatory activity that every user should do. Then, the third section shows many examples of flow experience such as rock climber, rock dancer, chess player, physician, and teacher, etc. Users would browse each flow experience as they want to read.

Definition and components of flow

This first section shows what flow is. Csikszentmihalyi proposed this concept (Csikszentmihalyi, 1975) and a wide variety of research, related with flow theory, has been done so far, including its measurement, called flow state scale (Jackson & Marsh, 1996). Flow consists with many components. 10 components are listed in this introductory material (Csikszentmihalyi & Rathunde, 1993).

Personal flow experience
After understanding the definition of flow, users are requested to think and describe their personal flow experience which they have had before. It does not limit to teaching and learning. They would write their personal experiences, surrounded situation, and emotion/thought at that time. Then, self-evaluation is needed to rate a depth of the personal flow experience. Besides, these experiences are stored in the database and would be shared in the open flow-based learning community.

Examples of flow experience
There are many flow experiences written in the literature. Csikszentmihalyi conducted many interviews with professionals such as rock climber, rock dancer, chess player, and physician, etc (Csikszentmihalyi, 1975). Those professionals said their flow experiences with their language. Figure 2 shows the words from a rock climber (Csikszentmihalyi, 1975). In addition, flow experience examples of athletes, business people, teachers, students, etc. are shown in this section.

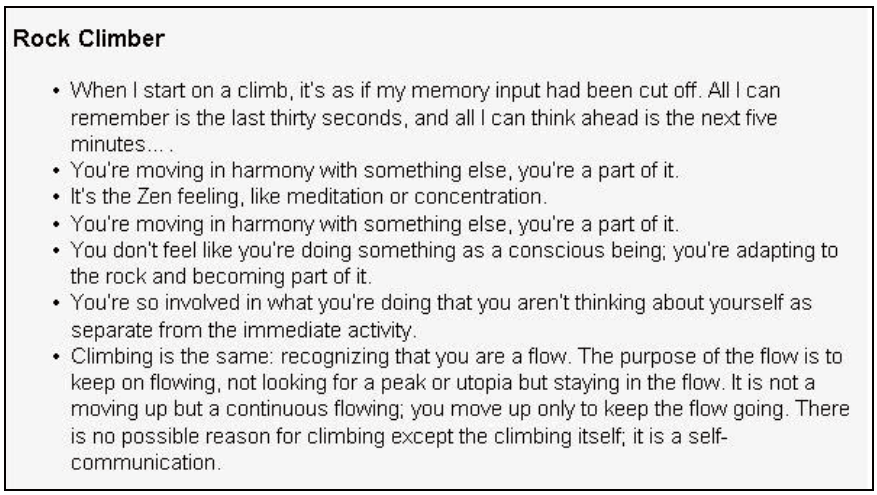

Figure2. *Flow experience from rock climber*

Reflection on personal flow experience
After browsing and understanding some examples of flow experiences, users would have some reflective work on the previous personal experience, which has just done before. Then, they could change their description and rating if needed. Besides, if other personal flow experiences come up to their mind, they could add them to the flow experience database.

CHCEKLIST FOR COMPATIBILITY OF FLOW THEORY
This checklist is designed for checking the compatibility with flow theory in terms of teaching/learning environments. Before the detailed description of each checklist item, users should write their own teaching/learning environments/courseware to be redesigned. They include target user, online or offline, subject matter, features, issues, and experiences, etc. According to the checklist development checklist (Stufflebeam, 2000), this checklist has been developed as it is still an initial stage. The checklist continues to be under development through a process of evaluation and operation, though a magnitude of changes of the checklists might be getting smaller. The items of the checklist are mainly derived from Flow State Scale, which was developed to be applied in sport and physical activity settings (Jackson & Marsh, 1996). Some of them are from other researches about flow theory and its applications and theoretical considerations. A synthetic approach is proposed to integrate flow theory and the motivational design

theory of instruction (Rezabek, 1994). A learning process with educational games is analyzed and it is found that reflection can play an important role of fostering motivation (Paras & Bizzocchi, 2005). Components and antecedents of flow experience are examined in the context of navigation behavior in online Web usage (Novak & Hoffman, 1997). Some tips of web site design that promotes users' flow experience are presented as an emotional web design, including usability (van Gorp, 2008). A framework of flow in computer-mediated environments, such as online games, is proposed. It is based on experiential learning theory (Kolb, 1983) and called an experiential gaming model (Kiili, 2005). Flow is shown as one of the factors of "Relevance" in ARCS motivational design model (Keller, 2009).

There are three types of appearance of the checklist. The long, precise, and informative checklist includes all information about checklist items and its precise descriptions and examples. The long checklist omits detailed description so that users can easily get directly to each checklist item. The final one is very short checklist for people who have much experience of teaching /designing and much knowledge and deep understanding about flow theory. It might include only minimum checklist items. Items of the checklist are derived from many research results and those checklist items have been modified in order to apply to educational applications. Figure 3 shows the simple and short checklist example for expert users. There are no extra descriptions and explanations of each check item.

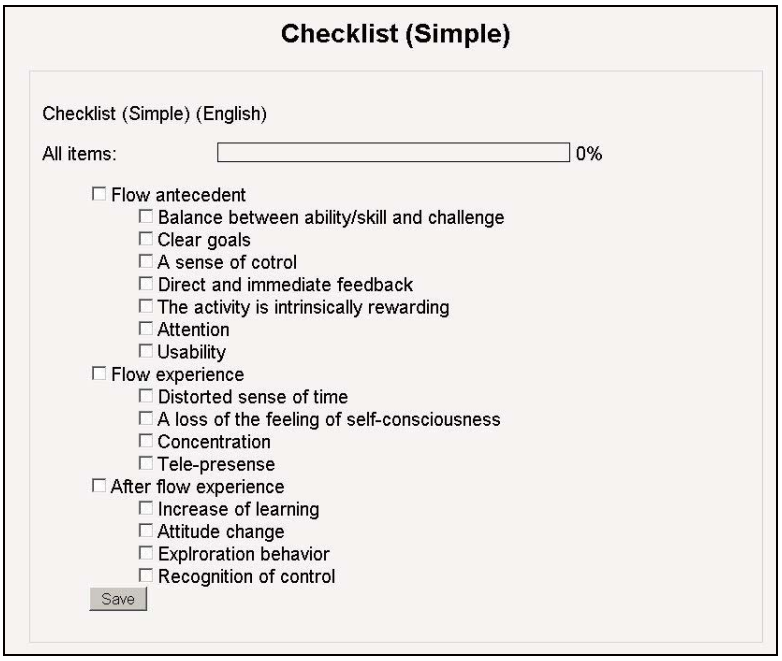

Figure3. *Simple checklist*

PROTOTYPE SYSTEM

A prototype system has been developed under Moodle system (Dougiamas & Taylor, 2003), because it is open source based system and widely used Learning Management System (LMS) not only in Japan but also in many universities and institutions across the world. Users can use usual web browser on ordinal PCs to access this prototype system. Besides, multilingual function embedded in Moodle can be applied to this system in order to build global community of flow-based learning and teaching. Moodle would be one of the best open source LMS, which has extended functionality as well as basic functions. It is easily expandable and many users in the world are developing and supporting new modules and functions. This system can be an initial stage of this flow-based redesign approach. It would provide several functions, such as learning flow theory, knowing teaching practices with flow theory, finding keys to redesign learning environments, sharing flow experiences and teaching methods, and building flow-based learning community, and so on. Some add-on modules, which are available at that time, would

be used to realize this prototype system. If there is no appropriate module available, a specific module should be developed to implement this flow-based redesign framework. Moodle is very flexible and expandable tool for e-learning and community building.

CONCLUDING REMARKS

Some expert reviews will be conducted to get feedback about the feasibility of this approach of the flow-based redesign and some hints to improve this approach. In addition, one-to-one formative evaluation will be also needed before doing small group testing and being open to public. This site and redesign approach shall be open to public because ongoing formative evaluation is embedded into this activity, so flow-based redesign involves in its redesign process itself recursively.

The initial expert reviews might confirm the feasibility of this framework and its introductory learning materials. Some feedbacks about design of activities would be given. A whole system, including an introductory courseware and checklists will be completed in the near future. one-to-one formative evaluation and some field tests will be conducted after completion of developing each activity. Final goal would be to provide teachers, instructors, and instructional designers with a continual support tools for improving their teaching and learning environments in terms of motivational design by themselves. Flow theory seems to have possibilities to become a useful tool for that and it might also give us hints to our own learning as a learner as well as a teacher/instructor to become an autotelic and self-regulated learner.

In order to realize and disseminate this flow-based approach, future research should include the following pursuits:

1) Provide multilingualism and find global differences and commonalities
2) Build and share database of flow experience and redesign methods in real setting
3) Solve issues on individual differences
4) Use multi-device environment and increase mobility with smart phone or tablet devices
5) Secure from disadvantage
6) Increase popularity in educational areas/applications

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