

## IPAS –TEACHER’S KNOWLEDGE MANAGEMENT PLATFORM FOR TEACHERS PROFESSIONAL DEVELOPMENT

Tzu-Chien Liu<sup>1</sup>, Yih-Ruey Juang<sup>2</sup>

**Abstract** — *With the prevalence of information in the digital age, it is more important to assist teachers to manage their own practical knowledge. According to this perspective, this study first illustrates the relationship between the instructional plan and teachers’ practical knowledge. Then, this paper introduces the design rationale and functions of a teachers’ knowledge management platform – Instructional Planning Assistant System (IPAS), that can help teachers through the process of designing, reflecting, modifying, and sharing instructional plans to manage their instructional practical knowledge. Furthermore, this paper interprets the results of evaluation of the system’s function. Finally, the paper discusses the study results and further research directions.*

**Index Terms**  $\frac{3}{4}$  *Instructional Planning, Instructional Planning Assistant System, teacher’s practical knowledge, Knowledge Management*

### INTRODUCTION

Several previous researches have indicated that information technology are changing the teacher's role from information giver to facilitator, counselor, advisor, guide, coach, co-learner, mentor, resource and technology managers, and mediator to the students (ex. [8]; See, 1994) . As such, the key point of instruction is not the infusion of information but the construction of knowledge, cultivation of abilities, and illumination of wisdom. To confront the change of teacher’s role and instruction innovation, teachers have to review, arrange, reflect, reconstruct, and share their practical knowledge . In short, teachers have to appropriately manage their practical knowledge.

In order to meet the demand described above, we have created a teachers’ knowledge management platform, called “Instructional Planning Assistant System (IPAS)” founded by Ministry of Education in Taiwan. With the support of the platform, we hope that through the process of designing, implementing, reflecting, modifying, and sharing instructional plans teachers can effectively manage their instructional practical knowledge and promote their professional development.

The following paper is going to illustrate the relations between instructional planning and knowledge management, how IPAS assists teachers in designing instructional plans and conducting knowledge management, and the initial evaluation of this system.

### INSTRUCTIONAL PLANNING AND KNOWLEDGE MANAGEMENT

In accordance with the rapid shift of teacher roles and speedy increase of knowledge, teachers have to manage practical knowledge to enhance their professional development. The teachers’ practical knowledge referred here does not mean the theoretical knowledge written in textbooks (ex. *educational psychology*). Rather, it refers to integrated knowledge that embedded teachers’ past personal school and life experiences, professional training of teacher education, professional theoretical knowledge, realistic teaching experiences, and individual belief and value [9, 11, 17]. In the realistic instructional contexts, teachers add specific meanings upon the instructional tasks with personal practical knowledge [3, 10]. According to those specific meanings, they determine the content, methods, and strategies of instruction [4]. However, teachers’ personal practical knowledge is usually internal and even unperceived. Thus, the practical knowledge should be cautiously managed to prevent from the piecemeal, loose, and fragmentary experience level, and further to be refined to instructional practical wisdom.

From the perspective of practical knowledge, the design, implementation, reflection, modification, and sharing of instructional plans is a way that teacher can use for managing their practical knowledge. The traditional function of instructional planning lies in allowing teachers to systematically prepare instructional materials, to pre-thinking possible steps during the process of instruction, and predicting and avoiding possible difficulties in the process of instruction. In addition to the traditional functions, an instructional plan is embedded with the following new meanings and functions:

- **Assisting teachers in externalizing their internalized knowledge:** Planning is a basic psychological process in which a person visualizes the future, inventories

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means, and constructs a framework to guide his or her future action [5]. As to individual teachers, the process of instructional planning is also the process of externalizing and organizing personal internal knowledge through logical steps. This process not only helps teachers design their instruction in advance but also facilitates them to review their process of thinking [7].

- **Helping teachers integrate instructional resources into meaningful practical knowledge to facilitate instruction actions:** Knowledge is a kind of resource allowing people to convert information into decisions and actions. Thus, it should be meaningful and applicable. If the instructional materials and resources are deviated from given instructional goals, methods, targets, and activities, they are merely information rather than knowledge. Their meanings to instruction are incomplete and their functions are also largely reduced. Instructional planning can help teachers integrate varied materials and resources with specific instructional goals, methods, targets, and activities [Stahl].
- **The process of designing, applying, evaluating, and modifying instructional plans enhances teachers' professional development:** Before the class, teachers' instructional planning helps them externalize and clarify relevant internal knowledge; during the class, instructional plans allows teachers to follow the directions without hastily making a decision; after class, teachers can review and check the predetermined instructional goals and further reflect and modify the goals. This continuous process – designing, applying, reflecting, and modifying – enables teachers to constantly externalize their internal knowledge, to activate externalized knowledge, to modify or reconstruct the existed practical knowledge based upon the results of actions, and thus makes teachers' profession develop [1].
- **Instructional plans as a vehicle for transmitting teachers' professional knowledge:** As to teachers' practical communities, owing to the quite differences among teachers' practical ideas and styles, they hardly apply other available instruction models to concretely present professional knowledge. Since instructional plan has some formats in common, it provides teacher communities with the base of exchanging and sharing practical knowledge. Professional knowledge or innovative ideas, such as instructional methods, ideas, and content, can be disseminated to others with instructional plans through different channels (ex. The Internet) [12].

Because instructional plans have above function, the design, implementation, reflection, modification, and sharing of instructional plans can help teachers manage their practical knowledge.

## TEACHER'S KNOWLEDGE MANAGEMENT PLATFORM

Despite that the design, implementation, reflection, modification, and share of instructional plans facilitate teachers to manage practical knowledge, the majority of teachers only shortly process mind planning before the class because they are often busy in ordinary matters and instructional planning invokes a lot of consideration [13]. Mind planning is characterized as internalized, temporary, fragmentary, and less of structure, so teachers' valuable practical knowledge cannot be reviewed, introspected, and managed. Imagine this: everyday a great deal of teachers think about what and how they are going to teach and put them into practice based upon specific instructional contexts; however, the practical knowledge that guide the teachers are rarely appropriately reserved, managed, and shared. In contrast to the negligence of practical knowledge in teachers' professional field, other professional fields actively and effectively record personal practical knowledge and thinking process (ex. engineer's design blueprint, doctor's diagnosis, lawyer's individual case and judgment). Hence, it is necessary and urgent to assist teachers in doing effective knowledge management in their busy instructional practice.

Using technologies to scaffold thinking and activity enables learners to do more advanced activities and to engage in more advanced thinking and problem solving than they could without help [2]. IPAS provides three kinds scaffoldings to assist teachers in designing, arranging, reflecting, modifying, and sharing instructional plans. The main purposes and tools of the three scaffolding are displayed in Table 1, and the following sections we will go into detail about these.

TABLE 1  
THE SCAFFOLDINGS, PURPOSES, AND TOOLS OF IPAS

Three kinds of scaffolding	Purpose	Tools
Designing scaffolding	Lowering teachers' cognitive loading during the process of instructional planning	1.Template oriented designing guidance 2.Information filter 3.Personal portfolio-archive
Social scaffolding	Forwarding cooperating/collaborating and sharing among teacher communities	1.Co-design Studio 2.Quoting model plans
Metacognitive scaffolding	Promoting teachers self-monitor and reflecting	1.Self-assessment checklist 2.Design and instruction notebook

### Designing scaffolding

The research in cognitive psychology has shown that the people's working memory can only simultaneously deal with five to nine chunks [15]. When a person has too much to deal with at the same time, this will lead to cognitive

overloading and thus lower working efficiency. Since teachers need to consider many complex conditions during instructional planning, they are possibly mindful of one thing but negligent of the other. The “designing scaffolding” that IPAS provide can lower teachers’ cognitive loading during the process of instructional planning. Design scaffolding including three main tools as follow.

- **Template oriented designing guidance:** During instructional planning teachers may have too many different ideas and do not know how to start. IPAS uses template oriented designing procedure to guide teachers to convert their ideas into instructional plans. The six major steps are described in the Figure 1.

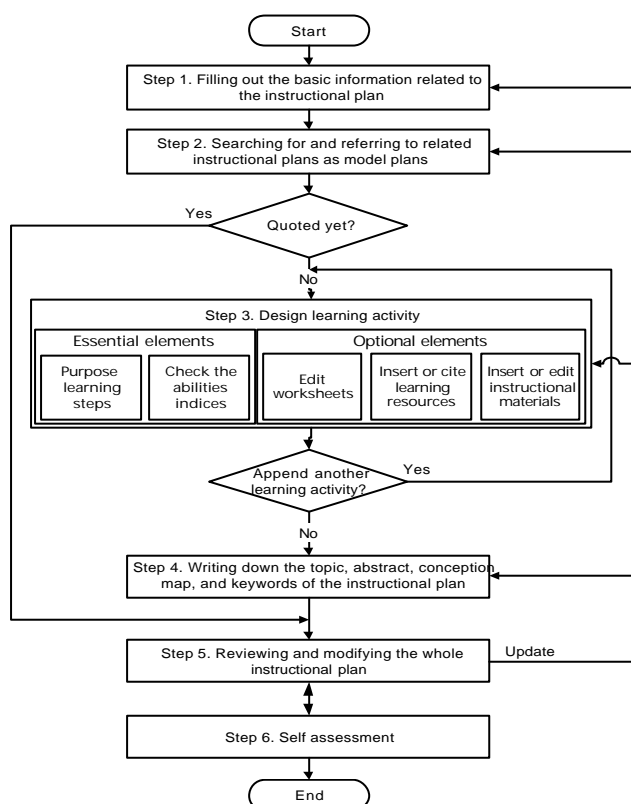


FIGURE 1

STEP BY STEP DESIGNING PROCEDURE

There are two functions of this tool. First, the systematic and procedural guidance give teachers a direction of thinking about how to design instructional plans; moreover, an overview of whole instructional plan makes them to grasp and catch on design issues. teachers can easily perceive the contrast among teaching procedures of each teaching/learning activities by browsing them together. Second, Template-based tools simplify the complicated work of designing instructional plans, and all content can be stored structurally within databases to benefit share and management.

- **Information filter:** Because instructional planning requires considering many items that are related to each other, planners often make too much effort in the details, resulting in cognitive overloading. As such, this system utilizes the Information filter to solve this problem.

From Step 1, IPAS will automatically fill out the data planners have keyed in so that the planner needn't to key in the same data again. Moreover, in the following step the system will automatically narrow the range of the new information based on the data provided by the planner earlier in order to provide more suitable information that meet the demand of the present instructional plan. For example, based upon the grade, subject determined by the planner in the first step, the system could automatically present the corresponding ability index for teachers to mark arbitrarily during instructional planning in the third step (see Figure 2). In editing worksheets, the system will automatically provide and list the ability index marked by a teacher earlier during some instructional activities (see Figure 3). This leads the planner to consider whether the designed worksheets suitable for the instructional activities and what are the ability index that need to be generated for the worksheet to examine the instructional plan.

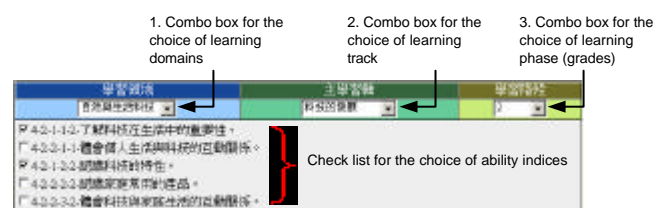


FIGURE 2

THE CHECKLIST OF ABILITY INDEX IN THE PROCESS OF DESIGNING INSTRUCTIONAL ACTIVITIES

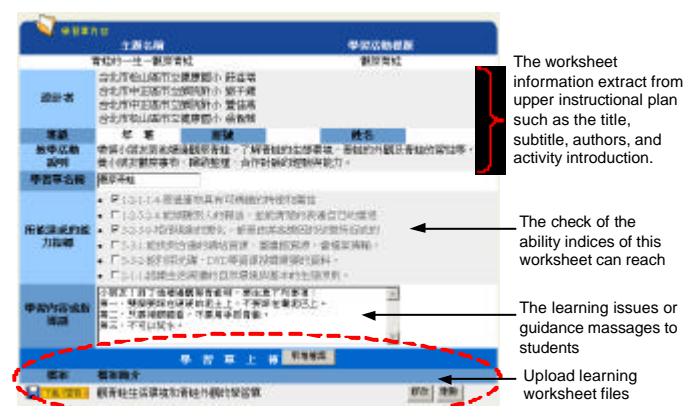


FIGURE 3

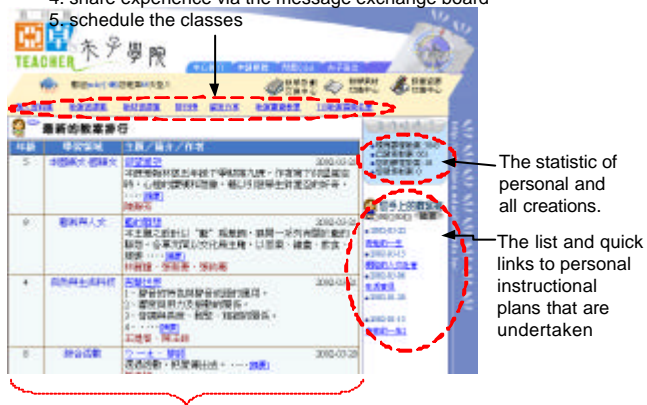
WORKSHEET DESIGNING

- **Personal portfolio-archive:** With the growing development of computer technology and the Internet, using computers to make digital instructional materials

or utilizing the Internet to search for digital resources is more prevalent among teachers [18]. Thus the minute and complicated digital portfolio management task is becoming teachers' annoyed problem. Based on a concern regarding this, IPAS considerably provides a "personal portfolio-archive" to every teacher who has registered at the platform.

In the "personal portfolio-archive", all personal instructional plans are arranged in specific categories, and relevant instructional materials, worksheets, and instructional resources are integrated with the specific instructional plans. Therefore teachers can manage their own digital instructional portfolio very easily. The figure 4 shows the frame of personal portfolio archive.

- Personal workshop provides the functions to:
1. check/update personal information,
  2. create/update/manage/search instructional plans,
  3. manage learning resources,
  4. share experience via the message exchange board
  5. schedule the classes



The list and quick links to recent published plans (include their titles, learning domains, introductions, authors, etc.)

FIGURE 4 PERSONAL PORTFOLIO-ARCHIVE

**Social scaffolding**

Teacher communities of practice need chances for planned interactions, tools for joint review and annotation of education resources, and opportunities for on-line collaborative design activities [2]. Based upon this perspective, IPAS provides two tools to promote teachers to co-design and share instructional plans:

- **Co-design Studio:** To face the challenge of instruction innovation, teachers should extend the barrier of classrooms to combine other teachers' professions to co-design instructional plans. The virtual "Co-design studio" facilitates teachers' utilization of the characteristic of the Internet – unlimited constraints of time and space – to organize groups and further to cooperative/collaborative designing instructional plans. When co-designing an instructional plan, all members in the group can edit and manage the same instructional plan (synchronously or asynchronously) after setting personal identification (ID) in the Co-design studio (see Figure 5). Additionally, this tool enables teachers

to form different cooperative/collaborative groups based upon the need of different instructional planning.

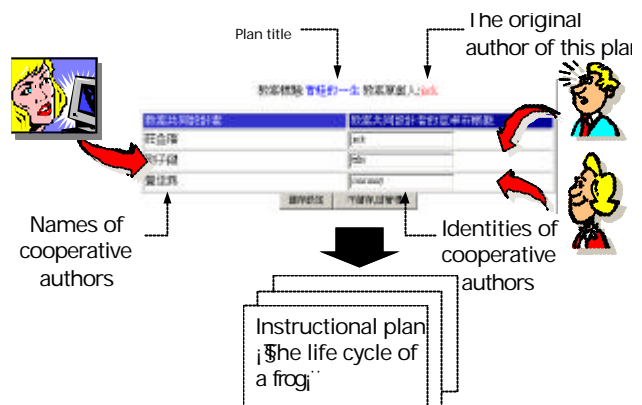


FIGURE 5 CO-DESIGN STUDIO

- **Quoting model plans:** In designing an instructional plan, the start is the most difficult stage to teachers, especially to novice teachers. "Quoting model plans" can automatically search for related instructional plans based upon the related information marked by the teacher (i.e. the grade, subject, major and related theme, and key words) and provide the teacher with a list and related information of the found instructional plans. Depending upon personal interests and needs, teachers can select an appropriate instructional plan shown in the list as a model and further modify the parts of the chosen instructional plan. Allowing teachers to follow and imitate other completed instructional plans, this function lowers the complexity of instructional planning and provokes personal creativity. Additionally, with the process of quotation and modification, this function enables the finished instructional plan to meet different needs and to generate the valuable efficiency. It should be noted that as long as any instructional plan is generated based upon the modification of reserved instructional plans, IPAS would present the name of the original instructional planner and provide the original planner with the user's quoting information and e-mail address. Its purpose is to protect the Intelligent Property Right of the original planner and to create a communication channel for the user and the original planner. With the mechanism of online interaction, the original planner and users are allowed to have a conversation and discussion so that the user can further understand the original planner's thinking process of designing the instructional plan in order to form teachers' professional communities.

**Metacognitive scaffolding**

Teachers can gain feedback as they bring their designed instructional plans into practice or enable other teachers to



use their instructional plans. The feedback, either self-assessment or other’s critique, not only make teachers reflect and grow but also promote instruction innovation. As to teachers’ reflection and self-monitor, this system provides two kinds of tools:

- **Self-assessment checklist:** During the instructional planning, teachers are often mindful of one thing but negligent of the other. With another possibility – people in doing something are often confused by the thing, it is more difficult for teachers to find out the shortcomings of their own instructional plans. The “self-assessment checklist” in IPAS is an online checklist with ten items, which aims at facilitating teachers’ assessments of their own instructional plans (see Figure 5). The process of self-assessment helps teachers re-think about the instructional plans they designed and better their instructional plans by modifying the original version of their plans based on the results of grading. Moreover, planners can evaluate the same instructional plan several times and the system will provide the results of self-assessment (depending upon the planner’s willing to release or keep the plan) for the following users.

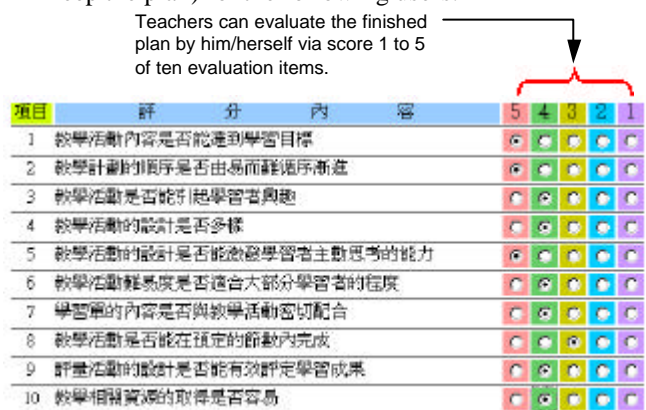


FIGURE 5  
SELF-ASSESSMENT CHECKLIST

- **Design and instruction notebook:** This tool has the following functions. First, while teachers may have some unrefined ideas, these ideas may be forgotten if they are not immediately recorded. The design notebook allow teachers to record their casual creative ideas for further uses. Second, after putting their own instructional plans into instructional practice, teachers may try to reflect the instructional plans as well as their instruction. The instruction notebook facilitates teachers in recording their reflection upon their instructional plans and the process of instruction. Third, planners can decide if they announce their instruction notes or not. If planners choose to announce their instructional notes, future users can review the notes through the function of “Quoting model plans”.

This design allows future users to gain the insight of the original planner’s valuable experience of the specific instructional planning and promotes more exchange of ideas and feedback.

### INITIAL EVALUATION OF THE USE OF THE SYSTEM

#### Research Procedure

Since IPAS Assistant system was officially announced in May 25, 2001, until March 18, 2002 it has successfully assisted teachers in creating 5,018 instructional plans, and among which 660 instructional plans have been published and shared. On average, the system helps users create 18 instructional plans per day. This demonstrates that the system has effectively achieved its goal of assisting teachers with instructional planning.

This study also conducted a survey of users’ opinions. 32 students who took the course of “Application of Computers in Education” in the Center Teacher Education, National Central University participated in the survey. These students will possibly become junior or high school teachers in particular subjects. The content of the questionnaire mainly concerns about if the tools of IPAS achieve the three major purposes displayed in the table1, including lowering the cognitive loads during the process of instructional planning, assisting teacher communities in cooperatively/collaborative designing and sharing instructional plans, and facilitating teachers’ reflection on instruction. This survey began in November 1, 2001 and lasted 4 weeks. During the period, the 32 students were asked to use IPAS to design an instructional plan. After completing the design, a survey was conducted in December.

#### Survey Results

- **Designing scaffolding:** As to the design of lowering the users’ cognitive loads during the process of instructional planning, 100% participants agree or strongly agree “Template oriented designing guidance” can appropriately guiding the planning procedure, 96.9% participants agree or strongly agree “Information filter” can select useful information, and 93.7% participants agree or strongly agree “Personal portfolio-archive” can support them to efficiently manage their instruction portfolio.
- **Social scaffolding:** As to the design of assisting teacher communities in cooperatively designing and sharing instructional plans, 96.9% participants agree or strongly agree “Co-design Studio” can support them to cooperative/collaborative design instructional plans and 93.7% participants agree or strongly agree “Quoting Model Plans” makes them more clear about how to design a good instructional plan.

- **Metacognitive scaffolding:** as to assist teachers' reflection on instruction, 78.1% agree or strongly agree that "Self-assessment Checklist" assists them in reflecting or modifying their own instructional plans and 93.7% participants agree or strongly agree that "Design and Instruction Notebook" helps teachers record their casual ideas during instructional planning.

In sum, most participants in the survey think that IPAS effectively achieves the three major functions described earlier. However, compared with other tools in IPAS, 21.9% participants held a conservative attitude toward the tools of "Self-assessment Checklist". Actually, several interviews were conducted with the students who chose the items of "disagree" or "strongly disagree". The results of the interviews show that part of the participants pose different opinions about some items of the self-assessment checklist. Accordingly, the present research will further modify the content of the checklist.

### CONCLUSION

Scholars and experts in knowledge management usually divide what individuals perceive into data, information, knowledge, and wisdom. Specifically, data refers to the facts without processing and without specific contexts; information is embedded with different contexts of different data so that it is logical and corresponds with specific contexts; knowledge includes past experiences and the combination of specific personal information and tasks, enabling people to make decisions and actions accordingly; wisdom allows people to introspect the process and results of their actions and further to induce specific principles or theories.

IPAS, as presented in this study, is a knowledge management platform for teachers to effectively manage their instructional practical knowledge through the process of designing, implementing, reflecting, modifying, and sharing instructional plans. According to the initial evaluation of the system, users largely regarded the system as effectively achieving the three major purposes (see Table 1). In the future, this ongoing study will not only continue to rectify the design and functions of the system based upon users' demands, but also integrate appropriate theories to expand the application level of this system, such as its application to teacher education and in-service teachers' professional development.

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