Adult CS Learning: Flexible learning from each other

ELS ROGIER and GERRIT C. VAN DER VEER
Open Universiteit, The Netherlands

We discus adult learning in the domain of Information technology. Our focus is on adult distance learning, with examples for ICT design. We show how adult learning in this case differs from traditional school learning and how teaching goals may differ from learning goals. In order to develop a generic understanding of how to design for adult learning we chose action research as a technique for our empirical investigation and growing understanding. We show how practice allowed us to develop a view on providing and structuring learning resources, resulting in an attempt to develop design patterns for the various levels of structure that we identified

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1. INTRODUCTION

1.1 Adult learners are not kids

In this paper we discuss how we can improve learning for adult learners in ICT education. In our examples we focus on the educational domain of design, which is the domain in which we have actual empirical evidence. Design is one of the most challenging topics in ICT learning, since the product is not predictable, there is no single best solution, and an acceptable result requires,both, knowledge, expertise and skills, and creativity.

Authors' addresses: els.rogier@ou.nl, gw@ou.nl.

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We define adult learners as learners who are able to choose or define their own intrinsic learning goals and find their own learning path. They may take a course out of private interest, or because their work requires them to gain extra knowledge or an extra degree. Some of these "students" are just interested in learning certain skills or knowledge but have no need for a certificate or degree and might not be interested in doing any form of assessment.

Adult learners differ in fundamental ways from school students and even from many university students that are sent (and supported) by their parents: Firstly, they start with a strong intrinsic motivation for the topic of the course. Secondly, prior to taking the course they often already possess relevant skills or knowledge or even job experience related to the learning material that is offered in that course. This added value can be useful for both a teacher and for other students being involved in the course.

An adult learner therefore is not just a receiver of knowledge and training but may be a source as well. And this type of learner has both the motivation and a growing insight in the learning resources, and the ability to decide whether guidance is needed on sequence of learning, on choice of what to study and how intense learning is requested, and on the need and scheduling of assessment. The knowledge adult learners possess can be very practical knowledge, especially when they already work in a domain related to the course. They might even have more practical knowledge on the subject than the available teacher, who might only be visiting "real companies" a few times a year. It would be a missed opportunity not to use and share this valuable knowledge.

1.2 Adult Learning Goals and Goals of Education Institutes do not Match

Adult learners have their own learning goals and context of learning. Their time available for learning is restricted. Even "full time" students in traditional universities often have a job, either as their primary occupation, or just as a way to survive, [Serebrin 2013] Consequently, a main goal for Adult education should be to support individual learning. Traditional (classroom face to face) teaching might sometimes work, but in practice it is often out of the question. Providing learning content resources, challenges and exercises, guidance, feedback on self assessment, meeting opportunities (where meeting need always not be physical or synchronous meeting), a help desk, formal assessment and certification, and pointers to all of these, seem to be the products a school for adult learning might well provide.

Still, current educational institutes seem not always aware of the goals and needs of their market and of the opportunities new technology provide to serve their clients. A European university for distance education, in January 2013, states as a main goal for educational offerings: "improving efficiency and increasing the inflow" where efficiency is defined as the percentage of students that graduate. A

European traditional university faculty of sciences aims (again in January 2013) at: "impact of scientific publications, increase of external financing of research, and an increase of international students" in that order.

Our aim is to develop generic understanding on how to optimally support adult learning. Since availability, functionality, and location independence of ICT is rapidly expanding, we aim at developing a systematic body of knowledge for making learning resources and learning support available for adult learners. This knowledge, formatted as design patterns, is intended for learning institutes, educators, and scholars who want to share their knowledge and insights with learners.

In order to develop our knowledge we learn from the learners: we study currently available adult learning resources, and we have the opportunity to be participant observers in actual learning situations, most of which are in fact courses that take place in a variety of University related contexts, from ad hoc one-week seminars to regular semester long courses, some with face to face meetings only, some with only distance learning, and some blended learning situations. Our role in most of these officially is considered to be a teacher or tutor. After our first attempts, we have decided to only accept that role if we are completely in control of, in collaboration with the learners, defining the learning goals, specifying the details of the domain, the type or resources, the way of communication and collaboration, the time schedule, and the assessments.

2. LEARNING TODAY

2.1 The difference between learning and teaching

In our native language, we use the same verb for the activities of learning and teaching: "leren". This confusion may be unique to the Netherlands, but the relation, and the difference in goals, between the two activities in practice is often not considered. The two concepts are certainly not two sides of a coin and not mirror images of each other. With adults students the goals of learning may well be unknown to a teacher and may well be inconsistent with the teacher goals.

In today's education the focus is often more on teaching than on learning. According to Ackoff and Greenberg traditional education incorrectly assumes that for every ounce of teaching there is an ounce of learning by those who are taught [Ackoff et al. 2008]. In fact, most of what we learn before, during, and after attending schools is learned without it being taught to us. Teaching is just one way of supporting learning, and often an effective one for young (non-adult) learners. A lot of what we learn in adult live however, we learn on our own, from independent study or play. Even when we learn through things being taught to use, a lot of the knowledge and information we are taught will be lost on us since our experience in practice turns out to be more effective.

2.2 Educational goals versus learning goals

Learning goals and educational goals might overlap at some points but they are definitely not the same. We want to clearly distinguish between different goals:

- First person learning goals are the goals a person sets himself / herself. These goals may be related to intrinsic interests, to current needs, to the aim for a (new) job or role, etc.
- Second person learning goals are the goals that are set by the teachers of a course in accord to his (didactic) view of what should be beneficial for the learner, or by an employer that wants his employee to acquire certain knowledge or skills in order to be more fit to (have less problems with) the needs for the job or role.
- Third person learning goals are goals of an educational institute or authority. These include the skills and knowledge a student should possess to successfully conclude a course or to receive a degree. These educational goals might be influenced by criteria that have to be met by government criteria. When educational institutes do not meet these criteria they might loose funding. These educational goals have hardly any relation with the learning goals of individual students.

One example of educational goals are the Dublin descriptors [JQI 2004]. The Dublin descriptors provide very general statements of typical expectations of achievements and abilities students should demonstrate at the end of first, second or third cycle, often described as Bachelor, Master and Doctorate. These descriptors, used in most European countries, are subdived in five sets of criteria:

- Acquiring knowledge and understanding;
- Applying knowledge and understanding;
- Making informed judgements and choices
- Communicating knowledge and understanding;
- Learning skills: capacities to continue learning.

In 1999 twenty-nine European countries participated in the Bologna Process, a series of meetings and agreements between European countries. In 2012 already 47 countries participate and the educational institutes in these countries are obligated to comply with the Dublin descriptors, on penalty of loosing their accreditation. When an education institute looses accreditation for a degree, it can no longer award the degree and often looses financial support. Therefore teachers are obligated to apply the Dublin descriptors in every course. These Dublin descriptors are third party goals because they might not be what a student wants to learn. They might no even describe what a teacher wants the students to learn.

2.3 An example of how a university wants us to develop courses

Here we critically review an electronic workbook [van den Boom, 2012] for creating a course at our own university. While this is a specific example of one university, we believe this example is relevant for many universities.

At our university the focus for developing a course is on the course developer itself. The workbook makes a distinction between making learning material and teaching learning material. We believe that for adult learning the focus should be on the students, not on the course maker.

According to androgyny, the art and science of helping adults learn, There are five assumptions [Knowles et al.1984]:

- self-concept: as a person matures his self-concept moves from one of being a dependent personality toward one of being a self-directed human being;

- experience: as a person matures he accumulates a growing reservoir of experience that becomes an increasing resource for learning;
- readiness to learn: as a person matures his readiness to learn becomes oriented increasingly to the developmental tasks of his social roles.
- Orientation to learning: as a person matures his time perspective changes from one of postponed application of knowledge to immediacy of application, and accordingly his orientation toward learning shifts from one subject-centeredness to one of problem centeredness.
- Motivation to learn: as a person matures the motivation to learn is internal.

Learners are individual people with individual needs and they bring along more experience than children. Cercone describes it as follows:

"The learning process is more than the organized acquisition and storage of new information. The learning process involves learning about oneself and transforming not just what one learns, but also the way in which one learns. It is also about sensing, visualizing, perceiving, and learning informally with others. Interaction and collaboration should occur in the learning environment to facilitate adult learning [Cercone 2008]

We conclude that the boundary between the course maker and the teacher is artificial and not in the best interest of adult students.

For our adult students we consider their needs at the time of participation. Even when this means we have to deviate from our original teaching plan. We want to learn from student and teacher experiences, beliefs, mistakes, growth in understanding of both teacher and students.

Moreover, especially in a field like ICT we also want to keep up to date during the course. New technologies, ideas, inspiration sources, grow every day. Websites can change significantly in a few months time. It is impossible to use all this when a course is fully specified beforehand.

3. OUR RESEARCH CHALLENGE: ADULT LEARNERS ARE NO GUINEA PIGS

Experiments do not work for adult learners. In our cases the students participate in education because they have a clear learning goal, though they have a limited availability of time and of opportunities to meet at a specified location. They are not motivated to participate in experiments, to do anything less than what we all consider optimal for learning. Often adult learning is not planned or programmed in advance, so we are not sure what will happen and when. Experiments would require precise planning in order to avoid confounding variables that would prevent detection of causality.

4. OUR APPROACH: ACTION RESEARCH

Action research allows research in situations where other methods may be difficult to use. Some other research methods neglect the active individual. Action research can take the context of active individuals into account. The context of these individuals is not static. In our research we deal with active individuals and societal change.

According to Eileen Ferrance:

"action research is a reflective process that allows for inquiry and discussion as components of research. Action research is a collaborative activity among colleagues searching for solutions to everyday, real problems experienced in schools, or looking for ways to improve instruction and increase student achievement. Rather than dealing with the theoretical, action research allows practitioners to address those concerns that are closest to them, ones which they can influence and make changes to. Consequently results are not "proven best general solutions, or proven truth" but "proven working solutions in context. Action research is not about learning why we do certain things, but rather how we can do things better. [Ferrence 2012]"

4.1 Why action research?

In our research we want to look at adult learners, with intrinsic learning goals, in their own environment and context, and we aim to improve their learning.

The context in which our adult students learn can be varied. Students:

- receive or have access to different kinds of teaching, e-learning, or blended learning;
- come from different cultures, countries, have different native languages, educational backgrounds, cultural relations towards each other and teachers or tutors;
- work in different places: university, home;
- have different access possibilities: (no) fast internet, firewalls;
- use different devices or combinations of devices to work on.

4.2 Definitions of action research

There are many definitions of action research. We will discuss some that might help get the flavour, and show the relative freedom of implementation that this type of research allows.

"Action research is a process by which change and understanding can be persuaded at the one time. It is usually described as cyclic, with action and critical reflection taking place in turn. The reflection is used to review the previous action and plan the next one." [Dick 1997]

In Dick's definition, action research is considered a cyclic process, were both active participation and critical reflection are important. Depending on the results of the reflection, elements of the process are changed in order to improve the process. The definition is general and not specific for one domain. We consider this a good definition of action research.

"A systemic inquiry that is collective, collaborative, self-reflective, critical and undertaken by participants in the inquiry "[McCutcheon et al. 1990]

In the definition from McCutcheon and Jurg action research is a systematic inquiry done by several people who critically reflect on the findings, indicating that something can be done after reflection, though this definition does not explicitly state it as an iterative process.

"a form of collective self-reflective inquiry undertaken by participants in social situations in order to improve the rationality and justice of their own social or educational practices, as well as their understanding of

these practices and the situations in which these practices are carried out" [Kemmis et al. 1990]

The definition of Kemmis and Mc Taggert considers action research a collective self-reflective inquiry, to improve the rationality and justice of their own practices and to improve understanding of what they are doing. We think it is important to note that this collective self-reflection should be done in a critical manner. Furthermore we think that action research can be valuable in more than just social or education practices.

"action research aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework" [Rapoport 1970].

The definition of McKernan refers to the goals of social science. We state that the use of action research can be a lot broader, allowing application outside the field of social sciences. On the other hand we are convinced that action research can only contribute to scientific understanding when the research is done in a critical way and where possible improvement of actions are again assessed in an iterative process, as stated in the next definition by Reason and Bradbury.

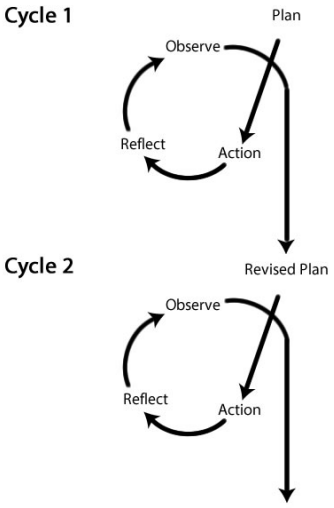
"Action research is an interactive inquiry process that balances problem solving actions implemented in a collaborative context with data-driven collaborative analysis or research to understand underlying causes enabling future predictions about personal and organizational change" [Reason et al. 2002]

4.3 Action research cycle

Research on adult learning is performed while students are actually learning. From the different definitions presented above we conclude that for our purpose action research:

- involves active participants;
- allows different opportunities for inquiry, including (but not limited to):
  - observation and recording behavior in situ,
  - observing and measuring products,
  - asking questions.
- needs critical reflection followed by planning action for confirmation, improvement or repair;
- is an iterative (or cyclic) process;

Action research as a series of cyclic steps is shown in the simple model from MacIsaac. [MacIsaac 1995]



Figuur 1 Simple action research model drawn based on the model from MacIsaac

Four different steps are visible in this model: (1) plan, (2) action, (3) observe and (4) reflect and plan again. These different steps are performed in a cyclic way.

First of all, we plan what exactly we want to investigate, then we take action to change things. We observe what happens and critically reflect our actions and observations with others.

5. OPPORTUNITIES FOR ACTION RESEARCH IN DIFFERENT CIRCUMSTANCES

One of us is regularly invited to teach courses in the domain of Interaction Design. As long as we are allowed to treat the students as adult learners, and to structure and continually re-structure the course in a way that we expect to trigger and support student learning we happily accept this opportunity to continue our action research.

5.1 When teaching goals are predefined

A Dutch University suddenly was without teacher for a full semester course in "user interface design" as part of a bachelor curriculum Information Sciences. There was a prescribed book already bought for all students [Rogers et al, 2011], which was a good choice as a main primary learning resource as well as from the viewpoint of structural support for adult learning. There were 125 students for whom this was the first time to meet user centered design. In order to have the students gain firsthand experience, we requested 5 tutors (students who took the course previously in a traditional classroom setting, all of whom turned out not to speak Dutch – an excellent reason to have the whole project in English) as well as access to real clients who needed a relatively small design like a website for a small enterprise. We also provided our student access to a website where they could find additional resources, where they could pose and answer questions and initiate forums with or without teacher or tutor participation (as specified by the students who initiated the forums).

We planned and acted as illustrated earlier, this time mainly focusing on the structure for the course as a whole since this was our main challenge. Our course features: a first classroom half day seminar on process, techniques, and pointers; bi-weekly assignments where the teams discovered the process and the tools and where a tutor met once with each of about 8 design teams of 3 students; where the teacher met with the tutor group to discuss the plan and to evaluate the observed student behavior and products; and where the teacher invited several of the teams to present at the next bi-weekly plenary meeting to present their project, their approach, and the lessons they learned so far. And we decided to have 2 or 3 groups design for the same client, either as competitors, or focusing on complementary designs in order to trigger awareness that there is not such thing as the "best" solution.

During the course we learned we should help our tutors focus on supporting the self-learning process and less on the content of the resources (students originally were concerned about what pages of the book should be read); We found students gradually developed a habit of using forums for asking for, and providing, knowledge and pointers to knowledge, when the teacher was not requested to participate. During the plenary meetings the teacher got questions and comments, on the process and the resources. The tutors were much appreciated for their availability and their support of self learning and peer teaching, which seemed to keep students active participants. We found, much to the relief of the chair of the curriculum, that only a small fraction of the students withdrew during the course (as far as we could find out, because this took them too much time for now, so they would take the course next year). All of those who continued, passed by showing individual as well as team products that illustrated their knowledge, understanding and experience in user centered design for a real client, at a level that convinced the exam authorities of the department.

5.2 When the customer is king

Several times we have been invited to teach courses for post-master students, with titles like "task analysis" or "visual design", e.g. for a German institute of Artificial Intelligence, or for a Dutch post-master curriculum on user-system interaction. These courses tend to attract about 20 highly motivated students for a full week. They have clear learning goals, there is no prescribed teaching goal at all, and no official final assessment.

Our plans and subsequent actions were simple: have the organizing institute find one or two real clients; provide the basic half day seminar, stimulate groups to develop solutions that would aim at alternative (or "competing") designs for the same client, and solicit peer teaching and critiquing regarding concepts, the process, tools, and techniques.

For these adult learners we did not get big surprises. We encountered opportunities to finetune our own examples of how to introduce concepts and techniques. We learned to be flexible in time schedule and process, to accept teams that merged or split, and clients that did not allow a team to present details of their design because of company confidentiality. We learned tools and techniques can be successfully applied in radically different ways from what the books tell us, and we collected highly illustrative examples of applications for which we got permission to re-use as future learning resources.

5.3 Youngsters can be adults as well

A group of bachelor design students in Italy (see Section 6.1) turn out to be very creative in finding a way to participate in group learning. We proposed to record all teacher as well as student presentations on video and put these on the course website, which was accepted as well as used (mainly to watch again, sometimes, as reported by students, on a smart phone while traveling by bus). A student who could not attend a plenary meeting, just decided to shoot a video of himself at home where he presented the technique he was scheduled to teach, and to upload this to the course website, so the other students could still take that mini course as well. Since everybody seemed happy about this solution to participate, soon another student copied this solution.

Students turned out to be so eager to prepare their design work and the related presentations that teachers of other courses complained about a declining number attending their class. We had to suggest students to keep their involvement in our course at the planned level.

In each of the 4 cohorts of 25 – 30 students we counted 1 to 4 students that dropped out of the course. All other students finished in time and passed the course assessment: the scheduled number of presentations (typically 3, teaching at a quality level accepted by their peers) and a visible quality contribution to the final presentation of the end product for the client and to the documentation of the process for the teacher.

5.4 Even if the authorities do not see the goal

Our first series of courses at a Chinese university felt like an adventure, since we had no knowledge of the culture of learning and teaching, or of the official goals of higher education.

We quickly learned that this level of education officially has no political priority, and, hence, the parents of students pay incredible amounts of tuition fees. Probably related to this, the students are all highly motivated to learn, and aim at knowledge, skills, and experience that they consider will help them get the job they aim at.

In our case we volunteered to be available for 3 courses of one week each. We were supposed to teach the 10 students in the final Masters year, but discovered that 2 or 3 PhD students decided to also participate fully. The students were left completely autonomous to set the class schedules, which turned out to be plenary meetings each day, including Saturday and Sunday. Our first course day included a 3 hour introductory seminar (our proposal) the other days the students scheduled 2 hours in class. On the course website we provided, traffic showed us students working from early morning till midnight. And even 1 month after the courses the sites were visited regularly by more than half of the students.

Students were eager to use the websites we prepared, where we needed to take special measures to provide availability of new videos of the presentations, since unpredicted firewalls may suddenly make websites unreachable. The students apparently appreciated the use of the websites so they spontaneously asked for access to upload their own PowerPoint prior to the presentations so other students could already see them.

Apart from the agreed courses on task modeling and service design we proposed to teach a course on design for cultural heritage and precious memories. The director of the hosting institute was sure this would not be of any interest in this culture. We insisted and presented the course.

Our action: the teacher showed the students examples from cultural heritage in the Western world that are only temporarily owned by private people (or institutes like museums) but are worth a life as anchor of a living culture beyond the life of the "owner". The students were challenged to bring pictures or a story about something of personal as well as historic value from their home.

We found students to contribute very personal and private stories and objects, like the account of a Buddhist family altar in a student's parental home (picture taking was not acceptable in that culture, so we got a detailed description and family history), and a hand written diary of a student's primary school period that was lost and recently found back by her sister who wrote a nice and personal cover story that was literally wrapped around the little booklet - the diary subsequently featured in the design of a tablet application for single family use.

5.5 To be continued

Action research does never end unless assessment shows all is perfect. Our students turn out to be adult learners who appreciate what we provide and at the same time continue to make us learn about how to apply new technology to support adult learning and to challenge us to provide more opportunities for free learning.

6. EXAMPLES OF OUR ACTION RESEARCH IN DIFFERENT CONTEXT

6.1 Action research cycle in practice

One of us was asked to teach a one semester course on Service Design in the University of Sassari, Sardinia, Italy. This course, for which the students were expected to spend about 200 hours, was part of the Design curriculum in the Faculty of Architecture. A service is the intangible equivalent of a good and service design. Service design is the activity of planning and organizing people, infrastructure, communication and material components of a service in order to improve its quality and the interaction between service provider and customers. [Wikipedia].
The audience consisted of rather creative design students, most of whom in fact were active as professional designers. In the audience there were always some non-native-Italian speaking students. We knew the audience and had been teaching other courses in this curriculum before. We knew English as a second language would work fine for teaching.

(1) Our plan: We expect our students would prefer to be considered professionals, would be motivated to learn a new field of design, and would prefer to explore the process and the techniques at their own pace and order. Since we were totally free in developing the course we decided to minimize classroom teaching, restricting the "classical" teaching to a bare introduction, and continue by facilitating and stimulating, as well as by triggering peer supported learning.

(2) Our action consisted of starting the course with a one-day seminar on the concept of services, its history in modern culture, and we pointed to a selection of relevant literature on this. In addition we sketched a possible design process that included an iteration of:

- analysis of a current state including all stakeholders and potential future stakeholders;
- competitor analysis;
- envisioning of future services, in close collaboration with stakeholders;
- prototyping the new services process;
- assessment of this with different stakeholders.

Finally we provided a course website with the relevant literature and the teacher presentation slides, as well as a pointer to an external collection of (close to 50) service design tools. For 5 of these we gave a brief presentation (10 minutes) where we showed:

- the problem that could be tackled with this tool or technique;
- how to apply the technique;
- a rationale for why this could sometimes work;
- a few examples of real cases;
- pointers to other examples.

After this we invited each of the students to select one from the list of tools and techniques and prepare a mini-lecture for next week. For the rest of the week the teacher was only available through email, and the students worked for up to 12 hours from the website, following the pointers, and preparing their own mini-lectures.

(3) Our observation, during the next face to face meeting with the group, focused on the student presentations and the discussion of these by the peers. Some presentations were simply met by understanding or even excitement. Some triggered questions for explanation or, alternatively, skepticism on the effectiveness or efficiency of the technique discussed, and some did not seem to stir any comments. And, luckily, we video recorded the students' presentations.

(4) Reflecting on this, we observed a strong difference in quality of the student presentations on different dimensions:

- some presentations were not optimal because of presentation styles (and possibly presentation skills – e.g., a lack of fluency in speaking English);
- some presentations lacked a systematic structure (e.g., like the structure in our example presentations);
- some presentations did not show any originality in the examples, or in the explanation of why and when this could work.

We concluded that we should try to make the students aware of the value of using a language and presentation that all could understand and discuss. Also, students should understand the value of systematically structuring the discourse on why and how to use a technique, illustrated with examples and challenging their colleagues to find out more. Finally we concluded students should understand that an obvious potential for creative application of a technique makes it more relevant to consider it.

These conclusions fed into a new plan that we subsequently executed: before introducing the next batch of tools and techniques to be discussed, we included another exercise. We put all student presentations on the course website. We selected 5 that were very strong on ,i) the performance and presentation (and we made sure one of these featured a student that used a sheet of paper with written out English text resulting in the elimination of language problems), ii) the structure of the lecture, or iii) originality and relevant creativity. We mentioned these 5 as "Some of the best" and we asked each student to write in an email for each of these 5 why these were exceptionally

good. We expected students would in this way experience firsthand what would make a thorough treatment of a technique or tool, i.e., what is relevant for the learner to pick up from a learning resource of this type.
This was one cycle of the process, but within this research we continued with more cycles because we wanted to explore more about improving presentation skills and learning from and with each other.

It is important to note that during reflection we want to look beyond the borders of our own world, and look at how other people do things. Seeing the strength and weakness in what other people are doing can help make a good judgment and help direct future plans.
Because change is an essential aspect of action research the method is well suited to deal with "living" individuals and societal changes.

6.2 Splitting up courses in smaller blocks

During courses we sometimes ask students to watch a video as part of their homework. In this specific case students had to log into a website with their login, watch several videos and after each video they had to fill in a questionnaire. We logged the actions of the students with timestamps. When we analyzed the results, we noticed through the timestamps that several students did not watch the entire movie before filling in the questionnaire. People started skipping part of the video when the videos became longer than 10 minutes.
In other courses with a similar setup and different students we noticed the same pattern of students skipping through longer videos.
Therefore we split up our course videos in smaller chunks of maximal 10 minutes.

7. WHAT WE LEARNED THROUGH ACTION RSEARCH ON SUPPORTING ADULT LEARNING

Within our ICT courses with adults we aim at an accessible communication between teacher and students.

We want to present active content in our courses. Teachers should be able to update the content at any given time. The content can be changed because the content became out of date or obsolete, but also because the content does not relate enough to the current group of students.

Not only the teacher, but also the student should be allowed (and stimulated) to share knowledge with others. Different possibilities exist in a learning environment, depending on what kind of knowledge someone wants to share and depending on the feedback someone expects. Forums can be used to discuss questions or opinions, but also to share links to other resources. Students can sometimes upload files to the learning environment visible for the teacher only, for their peers only, or for both teacher and other students.

The exact way of communicating depends on the specific context of both the teacher and the students. The way of teaching, classical, blended, or online, will have an influence on this, but also the culture of the people involved.

7.1 Structure of a course

The electronic handbook that our university makes available to develop a course provides ideas of how a course structure can be made. The model proposed consists of an introduction, a main part and a closure. Within the main part you can recursively find the same structure again. Optionally a pre test can be offered to diagnose the entree level of the student and give study advice.

The introduction gives some information about the course or a part of the course. The main part holds the actual content of the course and the closure part minimally has some kind of assessment and an closure text. This structure is way too general and gives teachers very little help in how to set up a course.

In contrast, we propose a solution based four different levels, from lower to higher level structures these are: atomic learning activities; mini-courses; learning chapters; and complete courses.

7.2 Atomic learning activities

Atomic learning activities are the smallest possible tasks in our model. Examples of atomic learning activities are "Give me a definition of X", "Check my answer on question Y", "Give me an example of phenomenon Z". We do not divide them into subtasks.

An atomic learning activity is about performing an action on an explicitly defined object. Each of these atomic activities has a goal for the learner.

Multiple activities may serve (depending on learner or context) the same goal (e.g., present understanding to peers; or write an essay for teacher; may both serve the goal assess understanding of a certain phenomena"). Activities can also serve multiple goals. For example the goal of a student explaining a technique can be to stimulate explicit awareness of all aspects of this technique, as well as to solicit assessment by the teacher. Moreover, explaining a technique by a student can also help out another student that needs additional insight before deciding to perform that technique.

Atomic learning activities are short and flexible to adapt. It is usually easy to add, remove or adapt atomic learning activities. For example a student gives a good example of certain phenomenon he experienced during work. It is valuable for the teacher to add this real-life example.

7.3 Mini-courses

Mini-courses are activities that are a collection of different atomic learning activities. A mini-course deals with one topic but consists out of several learning activities to accomplish the goal of the mini-course.

This is the first level of our model on which we use abstraction.
An example of a mini-course can be "Explaining a concept".

- Give a motivating introduction related to the specific concept
- Explain the specific concept, what is the problem
- Give a definition of the specific problem
- Explain how to solve the specific problem
- Give feedback about the solution you provided
- Give pointers to more information about the specific concept

In this example the first level of abstraction becomes visible. The mini-course is called "explaining a concept" and not "explaining concept X". In our model we do not specify what the exact concept is, because we want to show a general structure that can be used to explain different kinds of concepts. The structure of mini-courses

should be re-usable for different situations, learning fields and context. The specification however is still visible within the atomic learning activities that form the mini-course. Within the actual mini-course the order in which atomic learning activities are performed can be fixed, but this is not always necessary.

Generally a mini-course takes about five to ten minutes to complete. The length is deliberately kept short because this allows students to keep a good attention during the span of the mini-course. Our research showed that when online mini-courses were longer than ten minutes students had a tendency to skip part of the mini-course or to stop.

We called this level a mini-course because this level gives students the shortest course possible on one aspect of their study which they can study independently during an empty time slot. This level is extremely important for adult learners because the independence and short amount of time needed to finish it allows flexibility in time management.

Adult learners sometimes find it useful to explain what they just learned to peers as a method of self-assessment. This kind of self-driven assessment can often take another five to ten minutes.

7.4 Learning chapters

A learning chapter is the next level in our model. Learning chapters are a collection of mini-courses dealing with one or more related subjects.
In a traditional course this would equal the amount a teacher teaches during one class or the amount that is presented in one chapter. We consider this to be an activity that typically takes one to three hours. Currently, possible alternative structures for learning chapters are still researched. We give some ideas of what elements might be part of a learning chapter

- Introduction of a learning chapter
- Explaining learning goals
- Explaining concepts
- Closing of a learning chapter
- Giving homework
- Doing an assessment

A learning chapter typically starts with an introduction and explaining the learning goals. The teacher can explain what the chapter is about and what the expectations of him/her are, the second-person learning goals. While not all students will consider these second-person learning goals important, they might be important to be able to understand the rest of the course.

At the end of a learning chapter, the teacher can do an assessment to determine whether the students comply to the learning goals set at the start of the learning chapter.

7.5 Complete courses

The highest level in our model is a complete course. Most teachers building a course are asked to develop a complete course, sometimes alone, sometimes together with other teachers, sometimes with the expectation they comply with a pre-defined set of learning topics and learning goals.

A complete course is the collection of different learning chapters that together give a broad view on a topic with several subtopics in it. There may be a fixed sequence or structure, there may be freedom for the teacher or for each individual learner. At this level the third-person learning goals will be visible because teachers are asked to comply with these goals by their employers. The Dublin descriptors we discussed earlier in this paper are an example of these third-person learning goals that might be visible at the level of a complete course.

When students want to get an official degree for a course they will have to adhere to these third-person learning goals and most likely will need to do some form of assessment.

7.6 Design patterns to present the structure of a course

All four of the above mentioned structures should be presented in a format that is easy to read and understand by teachers. The structure should be flexible enough to allow teachers to adapt their course to their specific needs in the context in which they and their students work and learn.

We believe design patterns would be a good choice to present these structures. Alexander described patterns as follows:

> *Each pattern describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice.* [Alexander 1977]

Design patterns are known, repeatable and generic solution to problems, but they are not specific. This means that they have to be elaborated and instantiated. Patterns give a lot of pointers on how to do that. The rationale within the patterns will allow you to understand the background of a problem and allows to decide why and when a certain solution is appropriate in a specific case.

One of the main advantages of patterns is that they can solve dilemmas when designing in a specific context because the rationale helps to make good decisions. A design patterns doesn't necessary guarantee the best possible solution. However, It will suggest a decent solution.

8. CONCLUSION

In this paper we point out that in current adult distance education learners, teachers and educational institutes can have different goals.

We belief adult learners are often capable people that can bring their own valuable experience and insights towards these educational institutes and their teachers. We should not just teach our adult students. Instead we should all become flexible learners, learning from the individual experiences, knowledge, strengths of others, regardless of whether you are a student or a teacher.

We proposed a model for structuring courses to support flexible adult learning. In our model we want to provide guidance to the teacher and the developer of learning resources. Nevertheless we also want to allow enough freedom to allow adult students to learn in the best possible way they can.

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