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## Eh, they even have a special tool, did you see that?

*Affordances in digital learning resource mediated interaction*

### Abstract

This article illustrates how the perspective *Designs for Learning* can improve the understanding of interface interaction in the educational setting. Furthermore the article demonstrates that the digital learning resource *does* add something to the learning process in a vast amount of affordances, but that only a small fraction is utilized by the users today. The video based research material was collected in Social Science classes of year 7 and 8, and analyzed with the model *Learning Design Sequence – LDS*.

### KEYWORDS

Designs for Learning • digital learning resource • affordances • interface interaction • Learning Design Sequence • LDS

### Introduction

This article builds on a new perspective on learning, *Designs for Learning* (cf. Jewitt, 2006), which has been developed in the research group DidaktikDesign at Stockholm University. This paradigm holds a double challenge in that it includes both technical design and learning designs. It embraces aspects of experience and active meaning making, the ideas about situated learning and the role of artefacts in the social cultural view as well as the importance of modes and multimodality in the socio semiotic perspective (Selander, 2007, 2008). In this article pupils' active meaning making is foregrounded when they engage in a Social Science theme given by their teachers. They engage with the subject content according to their interests and they use digital learning resources as tools to design multi modal representations such as films and PowerPoint presentations to

illustrate their learning. The digital learning resource enhances the complexity of the correlations between the subject content and the digital design and provides the pupils with a new arena or dimension to act within. Much has been written about how pupils interact with digital learning resources such as computers and the Internet, digital video cameras and mobile phones. This article concerns a narrowed picture of digital learning resource mediated interaction. I want to find out what the digital tools that pupils are using in the digital educational setting actually *add* to the learning process.

## Aim of study

The aim of the study was to find characteristics in interface interaction and describe the affordances offered in this interaction. With what means do pupils interact in the digital interface? What affordances are offered by the digital learning resources?

An underlying aim of the study was to visualize how the perspective *Designs for Learning* can be used to understand interface interaction in the educational setting. Examples from the research material are therefore displayed to illustrate the interface interaction.

## A view of digital learning resource mediated interaction

A year ago the European Parliament issued a recommendation on eight key competences of special importance for lifelong learning. The fourth one is digital competence and answers to a variety of skills such as the use of digital learning resources to retrieve, assess, store, produce, present and exchange information (2006/962/EG). The recommendation together with the Swedish school curricula tells us that digital learning resources ought to be used in school (Skolverket, 1994). In this article a wide view on digital learning resources is adopted. It can be anything digital used in the educational setting, not necessarily designed for education. A computer with educational software is evidently a digital learning resource but also the Internet, a digital video camera, an Mp3-player, a mobile phone or a scanner are digital learning resources although they are not specifically designed to be used by children in school.

An action is never an isolated activity, according to Linderoth (2004), to act is to inter-act. Digital learning resource mediated interaction is the actions that take place in the digital interface between pupils and digital learning resources. The digital interface is the link between the pupil and the hard- or software he or she is working with. In the digital interface there are possibilities for pupils to insert information via clicking on the mouse, using the touch screen on a mobile phone or pressing buttons on a digital camera. The digital learning resource is programmed to respond to this interaction with for example displaying images or text on the screen. Pupils create understanding and knowledge in this interaction (Säljö, 2000). Interface interaction is multimodal since

pupils use different modes simultaneously when interacting with the digital learning resource. What counts as a mode is different in different semiotic contexts (Kress et al. 2001). When reading on screen, text and hypertext are not the only modes (Jewitt, 2006). Pictures, icons, moving images and sounds are just as important. Learning is about being able to understand and make use of these different modes. When pupils are interacting with the digital learning resource they can for example click with the mouse, write a word on the keyboard, connect a digital camera to the computer, nod at the screen or record a sample of music. The different modes are linked together which complicates the distinction between them – the key to understanding the interface interaction is therefore to look at the whole learning process with all modes and media (Kress et al. 2001).

In the digital interface built-in affordances are offered. The concept of affordance originates from Gibson, who referred to it as the possible actions between a tool and a user. An affordance is a well designed interface that serves to increase the opportunities for behaviour (Gibson, 1979). An affordance implies the complementarity of the user and the environment and the mutuality of the affordance and the user is the essential (Gibson, 1982). This relation is determined by how and where pupils are able to grasp the digital learning resource. The digital learning resource's affordances can be of various kinds and at different levels. It can be tasks or challenges, i.e. designed modes (Selander, 2007). To mention an example, the digital video camera provides designed functions such as the possibility to cut a video taped sequence, zoom a detail or fast-forward a documented material. These can all be seen as affordances that the user might be aware of and choose to use, but it does not mean that they automatically do what the digital learning resource affords. With different affordances the digital learning resource allows and encourages the pupil to make active choices to find his or her own path of learning when transforming the presented information (Kress, 2006).

## Design of study

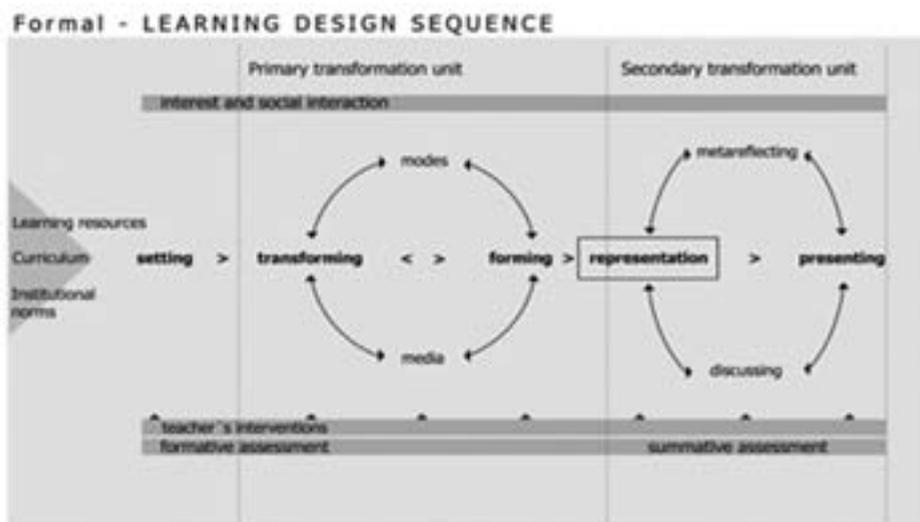
### ***Learning Design Sequence***

A model called LDS – *Learning Design Sequence* (Selander, et al., 2007) – has been designed within the research group DidaktikDesign at Stockholm University. The model is defined in two aspects; «action and time» as well as «representation and indications of learning». An LDS is a sequence of learning which is followed from start to end, a process during which pupils' signs of learning can be documented.

A theme or subject area is video documented from the teacher's introduction which is based on the institutional norms of the educational *setting* where the curriculum plays a decisive role. In this phase affordances, such as assignments or challenges as well as tools and digital learning resources, are introduced to the pupils.

Interaction is central in the *primary transformation unit* where pupils engage with information according to their own interest. They make meaning by transforming and forming the information with modes and media in social interaction guided by the teacher's formative assessment of the learning process.

In the *secondary transformation unit* pupils design their understanding in a representation such as a slide show, a film or perhaps a text in a process of discussion and meta reflection. The digital representation is presented and assessed at the end of the LDS. An LDS can last from a few hours to several weeks.



The notion of LDS is not known to the users; instead it is referred to as a theme or a subject area. The pupils are conscious of the *meaning* of an LDS and the teacher is well aware of the significance of an LDS and its different phases. Pupils involved in an LDS are not engaged with the same content; instead they choose different aspects of the LDS to engage with. This means that within the all embracing LDS there are miniature Learning Design Sequences as well, answering to the theme of the pupils' choice, depending on their own interest.

The research questions and the multimodal perspective imply the importance of documentation of all modes such as speech, pictures, gestures, screen activity and sounds. The pupil's interaction with the digital interface and the screen or display is video taped with one camera from behind or from the side. To be able to catch pupils' expressions and gestures from the front, a second camera has been used when possible. The video material is collected in the Stockholm area in schools that define themselves as being in the fore front of educational ICT. The material used in this study consists of two miniature Learning Design Sequences that sum up to about eight hours of film. These two

Learning Design Sequences have been chosen in order to get a coherent and significant foundation of data to analyze. Both Learning Design Sequences are in the subject area of Social Science with pupils in the same age. In this study digital interface interaction is the focal point and all material is from the primary and secondary transformation unit of the LDS.

### ***Fears – Handicap***

The first Learning Design Sequence is a three month project video taped in year 7 with the all embracing theme of Fears. The teachers have introduced the LDS with the question of what children are afraid of and the pupils are supposed to relate their thoughts and findings to the United Nations Children's Convention. A group of three pupils are video documented in the miniature LDS – *Handicap* – and they have themselves chosen the theme of what it would be like to become handicapped. They are making a poster about handicaps and they write a manuscript for a film about what they think it would be like to be physically handicapped. In most sequences the three pupils are sitting in front of two stationary computers. They are talking to each other while searching for images via Google on the Internet, viewing the paper copy of the United Nation's Children Convention or while manipulating a picture in an image program. They are engaged in a group work but simultaneously absorbed in individual tasks within the theme of handicap.

### ***Europe – The escape to Poland***

The second Learning Design Sequence is a one month project video taped in year 8 with the all embracing theme of Europe. The teachers have introduced the LDS with the imaginative information that the pupils suddenly have to leave Sweden and escape to another country in Europe. They are supposed to design a narrative about this trip including information about the country's Geography, History, Religion and Social Science. A group of three pupils choose to work with the miniature LDS – *The escape to Poland*. They are video documented in this LDS when they are designing a PowerPoint presentation in which they incorporate information and pictures found via Google and the website The Country Guide on the Internet as well as their own written narrative and their own digital photos. In most sequences the three pupils are working on one laptop each. They have divided the task but they are constantly helping as well as informing each other in issues concerning the digital representation.

### ***Design of analysis***

The analysis of the material is made in four steps; first the entire material of the two Learning Design Sequences is examined in order to find interesting sequences with a defined beginning and a defined ending (cf. *critical incidents*, Flanagan, 1954, Tripp,

1993). The selected critical incidents all show interface interaction where affordances are offered by the digital learning resource.

Secondly the critical incidents are transcribed. Units of analysis (Matusov, 2007) are all the different modes and a multimodal dynamic framework or transcription scheme is applied. The transcription scheme includes the columns: time, speech, digital learning resource, gestures and other. All modes are equally important but in different settings different modes are of different importance (Kress et al. 2001). These five categories are selected since they were considered to be meaningful in this specific study. Speech is not predominant although presented first in the scheme.

In the third step the transcriptions are analyzed in order to find patterns. Units of analysis are special features of interaction selected according to notions and phases in the LDS model. When the transcribed material is structured into categories, patterns in interface interaction appear.

Finally the patterns are categorized and an attempt to understand reasons and consequences is made. The results are compared to other research results in the same research field.

## Characteristics in digital resource mediated interaction

In the following, a selection of interesting patterns is presented. The transcriptions have been rewritten into paragraphs and a small sample is presented to illustrate the pattern. The time code and gestures are not presented since they turned out not to be meaningful in this specific analysis.

## The digital learning resource

These two Learning Design Sequences illustrate that pupils are confused about the role of the digital learning resource in the educational setting. This role can differ during the LDS's different phases as well as from situation to situation. Pupils' learning and thinking is intimately connected to the digital learning resource as when forming and transforming information or designing the representation. The social interaction between the pupils shows that it is not uncommon that pupils show signs of being uncertain of what they are supposed to use the digital learning resource for. A few pupils use it constantly while others view the digital learning resource as something to make use of in specific contexts where the role and affordances are obvious to them such as in the design of a PowerPoint presentation. The following excerpt, from the LDS *Handicap*, in the very beginning of the primary transformation unit shows a discussion about the possible use of the digital learning resource in the initial brainstorm when designing a manuscript for a film they are going to present in the end of the LDS.

The media is two stationary computers and the main modes are speech, gestures and screen activity:

Chris and Leo are sitting in front of one computer each.

Leo: *But, hey, we don't need computers for this. Let's go!*

Chris' screen shows the desktop and a window displaying what documents to choose. Leo's screen is displaying an open Word document. Chris is looking at Leo.

Chris: *Why don't we need computers for?...*

...Leo: *Well, we have not even thought about the name yet, obviously we can't begin writing it yet!*

The example visualizes the confrontation between different views on what the digital learning resource can offer. In the educational setting the computer is a natural tool in forming and presenting the representation. In the initial forming of the subject content to fit their interest, pupils seem to be more used to traditional modes and media such as discussions with pencil and paper.

In many instances there is a displacement of power where the pupils refer to themselves as not being in control of the learning situation. They can not always understand the underlying reasons for an occurrence like a sudden shut down of the digital camera, problems finding a document on the hard drive or auto corrections in Word. Instead they recognize the digital learning resource as the one taking decisions and acting independently as shown in the following example from the LDS *The escape to Poland* when a pupil in the primary transformation unit discovers that he has lost all the material he is about to use in the forming of a representation. The media the pupils are using is a laptop with a mouse and the prominent modes are speech, gestures, sound and mouse clicks on different icons:

Gabriel: *But it is a little funny though, you've got to agree on that!*

Failure beep sounds five times. Gabriel is laughing. John clicks on an icon several times getting the failure beep.

John: *Is it comic that I will lose all my work?*

A small window opens at the bottom middle of the screen.

Gabriel: *Yeah, because it's disappearing on its own. It's a little comic. It's sad like shit, but it's a little comic too, isn't it that it's just disappearing on its own?*

The social interaction and discussion between the pupils indicate that they recognize the digital learning resource to have an agency and an identity in the interface interaction.

## Digital interface interaction

The interaction can be described as semi digital since pupils interact on the one hand with each other in front of the digital learning resource and on the other hand with the

resource and each other in the digital interface. A few patterns stand out in the interaction in these Learning Design Sequences.

The pupils in this material are experimenting with identities. For example they pretend to have an English identity and log into [www.google.com](http://www.google.com) (instead of [www.google.se](http://www.google.se)) to search for the Swedish word for Poland (Polen) to be able to figure out what the country is called in English. Pupils are using each other's logins expressing that the computer ought to think that someone else is acting in the digital interface. Pupils make jokes in their digital representations in the primary transformation unit, jokes that are not perceived until in the secondary transformation unit. Much of the interface interaction is logged in the digital learning resource. If two pupils' versions differ in who has made a mistake they prove their point through showing the computer screen to each other. In the following example, from the LDS *The escape to Poland* in the primary transformation unit, three pupils are using one laptop and the current modes are speech, gestures, typing, mouse clicks and screen activity. They are discussing their login names:

John and Fred are trying to log into the local network with Gabriel's login. Gabriel is sitting next to them. Three open windows are displayed on the screen and a small login window is active. Underneath it is another unknown window and at the bottom a PowerPoint slide.

John: *Gaarf, Gabriel, is your name Gaarf?*

Fred: *Gasar, Gasar is his name, right?*

Login is succeeded and the login window closes. Fred is looking at John. John is looking at the screen, nodding when the login is correct.

The example indicates that pupils not only have a user's name – sometimes they act as if they have a digital identity. This digital identity is created in the LDS and results in that they for example do not take responsibility for a joke since the joke is only made digitally.

The multimodality of the digital learning resource offers possibilities for pupils to design mediated representations. Pupils do not have to be content with their own sounds, drawings or clip art images. Instead pupils form more authentic representations of for example a plaster with the right colour and size – only the realistic texture is missing. In the following example the media used is two stationary computers and the Internet and current modes are speech, gestures, screen activity with images and text. The example from the secondary transformation unit of the LDS *Handicap*, shows the pupils' discussion about whether it is correct or not to use a photo ad hoc found on the Internet:

Chris: *This one, look at this one!*

An image of an ice hockey goal keeper is on display on Chris's computer screen. All look at the picture.

Bill: *Do you want that one?*

Leo: *But, it's like this, I don't think it's fair to have a picture OF someone.*

All are mumbling. A new page with text is visible on the screen. All are laughing.

Chris: *Yeah, but what about this one?*

Chris's digital learning resource shows a picture. All turn to the screen of Chris's computer.

Ben: *Mmmm.*

Chris: *Well it is...*

Bill is joking: *But that is my grandfather.*

Bill looks at Chris and smiles.

Chris: *Nooo, bad!* Chris and Bill laugh. Lots of miniature pictures are on display on the screen. Leo points at the screen with a pencil.

Leo: *That's not a special person, right?*

The example shows that the pupils are aware of information and communication technology ethics and that the possibilities for realistic representations can cause ethical dilemmas since pupils can transform information to represent something that has little to do with the original information.

Different modes and media are used in the interface interaction. Pupils can use a semi digital work procedure where they copy an image found on the Internet, transform it in an image editing software, print it and form the paper image in order to match a paper representation. In the secondary transformation unit of the LDS *The escape to Poland* pupils copy each other's PowerPoint's manually using the media of two laptops and the modes of speech, gestures, colours, text, cursor, images and icons:

Gabriel: *Yes, OK. Take that one. It's OK.*

John's nature PowerPoint slide is on display.

Gabriel: *Eh, the nature, do you have that one?*

Gabriel's computer shows a PowerPoint slide with a flag.

John: *What does it look like, the nature? Yes, OK. But you don't have this one, right, facts about Poland?*

The same PowerPoint about nature is on both screens. Gabriel's text is highlighted.

John: *Yes, I do, but not in that colour.*

Gabriel: *Change it to that colour then.*

John: *But which colour is it?* John's screen shows a black slide with a small picture at the bottom.

Gabriel: *It's like... I'll see... Down. That one, that in any case. There, there.*

Gabriel's computer's colour palette is on display. His cursor moves over the palette.

John: *The headline in the same colour, or what?* Gabriel's headline is highlighted. John is pointing at Gabriel's screen.

It is most likely that the pupils are aware of the computer's affordances for transferring information between computers such as saving information on a memory stick or sending it via email; opposite this they apply a more traditional and time consuming approach.

Pupils transform and form information found on the Internet, information that frequently is not designed to be used by children in the educational setting. Internet offers

far more information than the pupils can manage and they apply different approaches to transform the found information into something understandable. In the following example, from the primary transformation unit in the LDS *The escape to Poland*, a pupil forms his own representation to compare facts about Sweden and Poland. The media used is a lap top and the web site The Country Guide and the predominant modes are speech, gestures, mouse clicks, buttons and digital tables:

Teacher: *Eh, they even have a special tool, did you see that?*

A split screen shows two PowerPoint slides. There are also five miniatures of slides at the left. The teacher is pointing at the top left of the screen. John is moving his hands over the keyboard.

Teacher: *Click on the Country guide again!* Internet site opens. John clicks at the bottom of the screen to draw attention to an internet site.

Teacher: *The one called compare countries. I've never tried it.*

A new window is on display on the screen. The teacher is pointing at the top left of the screen.

Teacher: *Compare... facts... Oops, it might be a little complicated, but...*

The teacher is looking at John. John is looking back and then gazes on the screen.

John: *Yeah, but I think... Wait, I think it might work. Let's begin here. Does it work with, eh, population...*

...John: *No, but... I'll do it, that... I do it this way... It is like two sites with what I will choose... And then I'll put them next to each other...*

It seems as if the pupil cannot identify with the comparison table published on the web site. The teacher intervenes to encourage him to use the guide but since she does not understand it she is incapable to guide him.

## Affordances

The digital learning resource offers unique possibilities to document and save information. In this material a role-play is documented as a film and objects are photographed. Information can easily be duplicated and saved at different locations and used in the classroom or elsewhere. The following excerpt, from the primary transformation unit of the LDS *The escape to Poland*, illustrates a pupil convincing his peer to make a backup copy of the representation in order not to lose the material. Two laptops are used and the prime modes are speech, icons and digital menus.

Fred: *Is everyone's Groups gone?*

A PowerPoint slide shows a comparison between different country facts. Intranet is being updated.

John: *Mmm, my one disappeared too. Noooo. Save it at different places this time; Fred, so yours won't disappear on your Groups.*

The menu is visible on screen. John is backup saving.

The digital learning resource offers unique possibilities for safe documentation and backup at different digital locations that are convenient to access during as well as after the LDS is finished.

A digital representation is not as definite as a more traditional representation since it can be transformed over and over again. The representation can even be altered during the presentation as seen in the following example from the secondary transformation unit of the LDS *The escape to Poland*. It exemplifies how the pupils are adjusting and re-designing the final representation during the presentation in front of the teacher and the class. The media used is a projector, a laptop and speakers and the key modes are text, images, speech and mouse clicks.

A black PowerPoint slide with a photo of a house is on display on the screen. The following text is displayed in red: «We had planned the escape to Poland in detail. We were supposed to get ourselves to the top of Sweden to be able to round Finland and over to Russia to get into Poland from behind because we could not go by car because then we had to show our passports and get caught.» John is reading from the computer screen.

John: *Me, Gabriel, and Fred were about to flee to Poland because we, ah, eh, we were supposed to go up north in Sweden and then into Finland and then into Russia and into Poland from behind, eh, because if we were to go by water for example, we would get caught.* The projector display is the focus of the class's engagement.

Gabriel: *The customs would catch us!*

John: *Yes!*

The example illustrates that the digital representation is a living document that can be used as a basis for meta reflection. It can be transformed before, during or after the presentation due to new information, the teacher's assessment or the social interaction with peers.

### With what means do pupils interact in the digital interface?

Pupils in this study are used to interact with digital learning resources and they are all more or less engaged in the interface interaction. Other research has shown that pupils that interact with the digital learning resource learn more than those who are passive (Ellis & Blashki, 2007). This material shows that the observing pupils are not passive, instead they interact with modes like gestures and speech, and can learn as much as the ones interacting with modes like mouse clicking and typing.

The pupils are interpreting the role of the digital learning resource. They do not always know how to engage with it and hence negotiate and use it differently in different situations. Pupils make sense out of situations by asking themselves the inner question of «what is going on?» and the answer they give themselves tells them how to interpret the situation (Goffman, 1974/1986). Most pupils in this study give themselves the answer

that the computer is a tool for searching, documenting, processing and presenting information. In other studies pupils have shown to establish rules of the use of the digital environment (Sancho Gil, 2005/2006) and so also in this study, where pupils tend to use the digital learning resource only after confirming it to be a useful tool in the specific context as seen in the example where the pupils argue that the computer is not a tool for thinking.

The result indicates that pupils consider the digital learning resource to have an agency and an identity that is in control of the interaction. Goffman (1974/1986) divides situations into two categories of primary frameworks: the natural and the social. In this study the natural framework is situations that the pupil cannot influence (such as a power cut shutting the computer down) whereas the social framework is situations depending on the pupil's will, aim or controlling agent (such as clicking on an icon). The material shows that pupils appreciate themselves as part of a natural framework when using digital learning resources (cf. Lantz-Andersson et al., 2008). They regard events as something that *just happens* without influence by their own or other human actions. Although the digital learning resource is produced by humans and the digital learning resource's actions are a response to the pupil's manoeuvring in the interface, the pupils think that the computer or digital camera is acting on its own. They are reluctant to take responsibility for mistakes as seen in the example where a pupil has lost his material due to having saved it incorrectly. Instead they put the agency at the digital learning resource. They do not learn how to act differently when the same circumstance reoccurs and therefore it is of importance that pupils frame the situation socially to be able to develop and learn how to save a document correctly or search for a suitable term in Google. In these situations the teacher's interventions and digital competence is of importance, both as guidance in technical support but also to mediate digital competence to the pupils. The teachers in this study are relatively advanced users of digital learning resources but sometimes they fail to support the pupils as seen in the example where the teacher tries to encourage a pupil to use a web-based function for comparison of country facts. The teacher has never tried the guide herself (although it is probably a recommended learning resource in the LDS) and fails to motivate the pupil. This scenario highlights the importance for teachers to inform themselves and their pupils about the affordances offered by the digital learning resource. It is also important that they prepare their interventions.

The pupils create a digital identity linked to, for example, their login ID at the Intranet, as illustrated in the example. The digital identity is developed through the possibilities of asynchronous and synchronous interaction in the digital interface. According to Goffman (1974/1986) pupils negotiate and validate different identities in face-to-face meetings, a meeting that in this study occurs in the digital interface. Pupils can take on different roles in different situations through adjusting verbal and non-verbal communication patterns (Goffman, 1959), such as pretending to have another mother tongue or making ironic jokes they wouldn't do face-to-face as illustrated in the examples. Taking

on a different identity is common and easily made in a digital context, depending on how digitally skilled the pupil is. Earlier research shows that the more the use of the digital learning resource is compatible with the pupil's role identity, the more comfortable the pupil is using it (Benson & Mekolichick, 2007). *How* pupils choose to interact with the digital learning resource might be of minor importance as long as they *do* interact. The pupils are given freedom in interface interaction during the transforming and forming phase which is thought to be a condition for pupils' active meaning making (Skolverket, 1996).

### What affordances are offered by the digital learning resources?

In this material a great part of the digital learning resource's affordances are not exploited by the pupils. Instead pupils sometimes apply a traditional and time consuming work procedure and can end up copying information by rewriting the text manually, although several alternatives such as digitally copy and paste, sending it via email or saving it on a memory stick would be a far better approach. Generally the software is not designed for the educational setting and therefore not adapted to pupils' needs. Additionally pupils are not aware of all built-in affordances in the computer or digital camera and can therefore not take advantage of them. The initial cost in time and effort considering learning how to use the affordances seems to be too high in the specific circumstance. If the pupils have never saved a document on a memory stick it might have a higher cost than copying the material manually as visualized in the example. The fact that saving on a memory stick or using the web-based function for comparison of country facts is efficient in the end needs to be mediated to the pupils, preferably by the teacher in the introduction of the LDS.

The digital learning resource offers a large number of affordances that the pupils make use of. One of those affordances is the authenticity that the digital learning resource supplies the educational setting with as referred to in the instance with the representation of the plaster. Digital tasks are thought to be more authentic and realistic (Lafer & Markert, 1994). Pupils make use of multimodal information in multimedia resources which gives a richer and more varied learning environment where different learning styles are stimulated. The authenticity is found to make the subject material accessible and real (Kerawalla et al. 2006). As seen in this material it can also cause ethical dilemmas. The teacher's assignment includes encouraging pupils to critically review information and meta reflect on ethical issues (Skolverket, 1994). Feedback from the teacher in the form of ethical discussions is common in this material and valuable for the pupils' meaning making.

What the pupils are able to understand and learn is to a large extent determined by what resources they are able to make use of in the learning context and how they use

them (Wertsch, 1998). The Internet provides the pupils with a lot more information than required. Most information found on the Internet is on a level above the pupils' understanding horizon, which forces them to transform the information and design their own understanding as seen in the example where a pupil designs his own digital comparison table of country facts – an action with great opportunities for learning. Pupils make meaning and learn in interaction through different choices, negotiations, transformations and formations, motivated by their own interest (Kress & van Leeuwen, 2001). The dense information gives the pupils more to explore and engage with. Most likely they can choose information offered by the digital learning resource that they are interested in (as seen in both Learning Design Sequences) which is an important condition for learning.

There lies an affordance in the digital representation as it encourages transformations of the digital product designed by the pupils. The representation is recognized as something that is easily redesigned as illustrated in the example about the PowerPoint presentation in class which opens up for feedback, discussions and meta reflections. Other research has come to the same conclusion; digital learning resources encourage young pupils to become actively engaged in the learning process (Kerawalla et al. 2006). The transformation process of the final representation does not have to be accomplished within the LDS or the school setting; instead the digital arena is wide as mentioned in another study where pupils carry on with their representations at home and in libraries (Sancho Gil, J.M., 2005/2006). In digital interface interaction the learning proposal is open and pupils' learning is not strictly framed by the subject or the LDS. Instead pupils are given the possibility to interact without restraints with the digital learning resource and engage with information they are interested in to design their own learning.

## Final remarks

This article has illustrated how the perspective *Designs for Learning* can improve the understanding of interface interaction in the educational setting. Furthermore the article demonstrates that the digital learning resource *does* add something to the learning process in a vast amount of affordances, such a vast amount that only a small fraction is utilized by the users today. In order to be able to benefit by an even greater part of the affordances, pupils need to take the initial cost of learning how to utilize them. As pupils get more digitally competent the initial cost will decline since they can learn from each other. Also, the teacher's interventions can lower the cost through mediating the affordances.

## Bibliography

- Benson, D.E. & Mekolichick, J. (2007). *Conceptions of self and the use of digital technologies in a learning environment*. Digital Technologies, Vol. 127 No. 4, p. 498–510
- Myndigheten för skolutveckling (2007). *Digitala lärresorser – möjligheter och utmaningar för skolan*. Stockholm: Liber Distribution.
- Ellis, K. & Blashki, K. (2007). *The digital playground: Kindergarten Children Learning Sign Language Through Multimedia*, AACE Journal, 15(3), p. 225–253.
- Europaparlamentets och rådets rekommendation den 18 december 2006 om nyckelkompetenser för livslångt lärande. (2006/962/EG) <http://eur-lex.europa.eu>. (2007-11-26).
- Flanagan, J. C. (1954). *The Critical Incident Technique*. Psychological Bulletin 51 (4), p. 327–359.
- Gibson, J. J. (1979). *The ecological approach to visual perception*. Boston: Houghton Mifflin.
- Gibson, E. J. (1982). *The concept of affordances in development: The renaissance of functionalism*, p. 55–82. In: W. A. Collins (ed). *The concept of development*. The Minnesota symposium on child psychology. Vol 15. IEA
- Goffman, E. (1974/1986). *Frame analysis: an essay on the organization of experience*. Boston: Northeastern Univ. Press.
- Goffman, E. (1959). *The Presentation of Self in Everyday Life*. New York: Doubleday Anchor.
- Jewitt, C. (2006). *Technology, Literacy and Learning. A multimodal approach*. New York: Routledge.
- Kerawella, L., Luckin, R., Seljeflot, S. & Woolard, A. (2006). «*Making it real*»: *exploring the potential of augmented reality for teaching primary school science*. Virtual Reality (2006). 10:163–174, Springer-Verlag London Limited 2006.
- Lantz-Andersson, A., Linderöth, J. & Säljö, R (2008) *What's the problem? Meaning making and learning to do mathematical word problems in the context of digital tools*. Instructional Science Springer Netherlands
- Kress, G. (2006). Seminar about multimodal notions at the Stockholm Institute of Education, 2006-02-09.
- Kress, G., Jewitt, C., Ogborn, J. & Tsatsarelis, C. (2001). *Multimodal teaching and learning The rhetorics of the science classroom*. London, New York: Continuum.
- Kress, G. & van Leeuwen, T. (2001). *Multimodal discourse: the modes and media of contemporary communication*. London: Arnold.
- Lafer, S. & Markert, A. (1994). *Authentic learning situations and the potential of Lego TC Logo*. Computers in the School. 1, p. 79–94.
- Linderöth, J. (2004). *Datorspelandets mening. Bortom idén om den interaktiva illusionen*. Göteborg: Acta Universitatis Gothoburgensis.
- Matusov, E. (2007). *In Search of the Appropriate Unit of Analysis for Sociocultural*

- research. Los Angeles, London, New Delhi, Singapore: SAGE Publications.
- Sancho Gil, J. M. (2005/2006). *Similarities, Differences and Challenges of Analogical and Digital Learning Environments. International journal of learning*, 7-2005/2006 Vol. 12.
- Selander, S. (2007). *Didaktisk design: den dubbla utmaningen. Digital kompetanse 3-2007* Vol. 2 p. 162–172. Oslo: Universitetsforlaget.
- Selander, S. (2008). Tecken för lärande – tecken på lärande. Ett designteoretiskt perspektiv. In
- Rostvall, A-L. & Selander, S. (red.). *Design för lärande*. Stockholm: Norstedts Akademiska Förlag.
- Selander, S., Åkerfeldt, A & Engström, S (2007). Resurser för lärande i en digital miljö – om «Learning Design Sequences». In S. V. Knutsen, D. Skjelbred & Aamotsbakken (red.) *Tekst i vekst. Teoretiske, historiske og analytiske perspektiv på pedagogiske tekster*. Oslo:novus Förlag, p 11–29.
- Skolverket. (1996). Kursplaner för grundskolan. Stockholm: Statens skolverk.
- Skolverket. (1994). Läroplan för det obligatoriska skolväsendet och de frivilliga skolformerna. Stockholm: Utbildningsdepartementet.
- Säljö, R. (2000). *Lärande i praktiken. Ett sociokulturellt perspektiv*. Stockholm: Prisma.
- Tripp, D. (1993). *Critical incidents in teaching: developing professional judgement*. London: Toutledge.
- Wertsch, J. V. (1998). *Mind as action*. Cambridge, MA: Harvard University Press.