THINKING STYLES AND SOCIALLY ENRICHED LEARNING MATERIAL:

DIFFERENTIAL EFFECTS ON MOTIVATION AND MEMORY PERFORMANCE

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In this study, we examined how learners are influenced when social information, in the form of a framework, is added to a learning material. The study was integrated in a class that the participants were taking. Motivational as well as memory performance effects were studied. In an assignment, two study materials were used, in which each of the materials came in a neutral as well as a socially enriched format. Earlier in the semester, the participants had completed a questionnaire that assessed their degree of interest in represented social contexts – their degree of person orientation. The results showed considerable individual variability in attitudes to the socially enriched frameworks. The study also points to individual differences as to whether social enrichment of a material supports memory performance or not. In addition, the results of the study indicate that the construct 'degree of person orientation' is meaningful in describing the variability both in attitude and performance. A pedagogical implication of the results is that we cannot hope for social enrichment of learning materials to be an instructional panacea. That is, cognitive scientists or instructional scientists will not be able to propose social enrichment as a general recommendation or guideline to designers of instructional materials. Rather, designers ought to be made aware of the individual variability in this respect.

Human beings are social and communicative creatures. From birth on, a human being orients herself towards other humans in the environment and responds to and initiates communication and interaction with them. This orientation is enclosed at a general level in human genetic equipment (Trevarthen, 1992; Vygotsky & Luria, 1994). The specific communicative patterns and social practices that human beings participate in differ between cultures and subcultures, but the motive to participate as such is a general human motive.

From a socio-cognitive perspective, the rich ability to take in and process various forms of social information, as well as the motivation to do so, is a human hallmark (Donald, 1991). An example of a socio-cognitive activity that recurs in different cultures is gossip. In his book *Grooming, Gossip and the Evolution of Language* (1996), Dunbar describes small talk and gossip as the first important step in the linguistic development of humankind. Nordenstam (1998) emphasizes the function of gossip – the composing of an everyday collective novel in which people and their behavior, relations and thoughts appear – as giving valuable practice in social problem solving. In attempting to understand the behavior and relationships of others, we become better prepared to handle our own involvement in future social situations. Gossiping may contribute to increased knowledge of how it is possible to think and act in different situations, and may augment one's understanding of human conditions.

Another fundamental human characteristic is our

ability to handle not only our own social environment and people who we are directly familiar with, but also social environments that we only know through *representations*, such as the more or less fictitious social environments in films, novels, magazines, (docu)soaps, and so on. And, again, we find human *motivation* to engage in and spend time on such represented social contexts.

TWO KINDS OF INSTRUCTIONAL IMPLICATIONS

The social nature of human beings has instructional implications. Some such implications have been strongly brought forward during the past decade, as the socio-cultural view of learning has gained a strong impact. The socio-cultural view frames learning as collaborating, interacting and negotiating, and the instructional implication is that learning environments should be designed to support these activities. This implication – which can be called the *learning process implication* – has been amply discussed as well as implemented. One early approach that bases the design of learning environments upon socio-cultural theory is the cognitive apprenticeship theory (Collins, Brown, & Newman, 1989). Examples of more recent approaches are Mwanza (2002) and Issroff & Scanlon (2002) who address the design requirements for computer assisted learning systems within the framework of activity theory.

Somewhat less discussed and focused upon is what can be called the *learning material implication*: given the human cognitive and motivational tuning to social information and contexts, it is instructionally beneficial to elaborate a learning material in ways that add social aspects to it. A number of studies have examined the ways in which the addition of characters enhances engagement and encourages exploration of a given information material in relation to learning. (Cf. Höök et al., 2000.) One of these is Lester et als' (1997) study, in which it is concluded that "[…] well-designed lifelike personae interacting with students using learning environments are perceived as being very helpful, credible, and entertaining" (Lester et al., ibid., p.4). A feeling of a positive personal relationship, it is maintained, promotes interest in the learning task.

The learning material implication is the focus of the present article. The concept *social enrichment of a learning material* will refer to when a learning material that does not as such require a social context, is nevertheless put in a social context and structured by means of social and person-related information. The terms *socially enriched format* and *social format* will also be used. Some examples are:

– A historical material, providing facts on e.g. the trading, housing and government of a period of time, is presented by means of stories about particular, fictive or non-fictive, historical people, portraying some of their life histories and personalities.

– A training material for mathematical problem solving is constructed around everyday problems, encountered by some characters who live or travel together, where background stories and personalities of the characters are presented as well.

– A biology material is presented by a fictive teacher, coach or co-learner, who guides the learner in the subject as well as gives an idea of him- or herself as a character.

Note that the examples just given can be implemented both in so-called traditional media and in computer-based media.

One form of computer-based implementation that specifically focuses on social enrichment of learning material, is that of animated pedagogical agents (e.g., Johnson et al., 2000; Lester et al., 2001; Moundridou & Virvou, 2002). Adding an animated teacher, coach or co-learner with some "personality" to a learning program provides a social dimension, which is considered advantageous (e.g., Lester et al., 2001; Moreno et al., 2001). Note that, in the case of animated pedagogical agents, the border between social enrichment of *learning material* and of *learning processes* is not clear-cut.

INDIVIDUAL DIFFERENCES

On a general level, the description of human beings as tuned to social information is well-supported, and so is, consequently, what we have termed the learning material implication. However, it is also known that given instructional environments and instructional materials affect individuals differently. One domain that addresses this issue is research on *thinking styles* and *learning styles*. The concept of style, here, roughly corresponds to peoples preferred ways of thinking and working with a material: to how they tend to think, process information and learn (Sternberg, 1997). Some definitions of learning style and thinking style involve complex relations between these two concepts, but for the purpose of this article we regard thinking styles as the ways in which an individual more or less consistently responds to and uses information, and learning styles as the ways in which an individual more or less consistently responds to and uses information in the context of learning (cf. Ford & Chen, 2001).

In the literature, two main categories of learning effects due to the match vs. mismatch of a learning situation to someone's learning style are proposed. On the one hand, there are motivational effects: a student's motivation to engage in a learning activity tends to increase if the presentation of a material, or a given task, matches rather than mismatches the

student's learning style (e.g, Sadler-Smith & Riding, 1999; Sternberg, 1997). On the other hand, there are performance effects: a student's understanding, problem solving capability or memory retention, etc. tend to improve if the presentation of a material, or a task, matches rather than mismatches the students learning style (e.g., Ford & Chen, 2001; Oberlander et al., 1996; Pask & Scott 1972; Sternberg, 1997; Stenning, Cox & Oberlander, 1995).

With respect to socially enriched learning materials, the present study addresses the three following questions:

– Are there significant differences in the extent to which students are motivated by socially enriched learning materials?

– Are students helped to significantly different extents, in terms of memory retention, by social enrichment of learning materials?

– If significant motivational and/or memory performance differences are identified, can these be related to thinking or learning styles?

THE PERSON ORIENTATION QUESTIONNAIRE

In earlier studies (Gulz, 1999; Gulz 2002), we developed a test instrument that assesses what we term *degree of person orientation*, that is an individual's interest in social and personal information, particularly in represented contexts.

The person orientation questionnaire has the form of a psychological scale, composed of thirteen 5-point Likert scale items, with anchors of "agree very much" (coded +4) and "do not agree at all" (coded 0). Scores on the scale thus range from 0 till +42, with a higher score indicating higher degree of person orientation. The items focus on a subject's attitudes and approaches to social information in representational contexts – not on a subject's social behavior and approaches to real life context with social actors. The following are examples of items (translated from Swedish):

– I often experience a kind of personal relation to people whom I am in fact only familiar with via media such as television, broadcast, newspapers, magazines, etc.

– I appreciate when information or facts are put in a context that concerns people and their everyday lives.

– I think that a speaker or lecturer should focus on the subject and not take up time by giving information on his or her own personal history.

Related Tests

There are some well-known style inventories that are to some extent concerned with social and person oriented aspects. The Myer-Briggs/Wiggins introversion-extroversion inventory (Myers & McCaulley, 1985) assesses habits and feelings regarding social life (e.g. how rapidly one gets involved in social life at a new workplace; to what extent one enjoys being at the center of events in which other people are directly involved, etc.). Sternberg-Wagners Self-Assessment inventories on the Internal vs. the External Styles (Sternberg, 1997) concern the extent of social sensitivity and outgoingness (e.g. to what extent one appreciates social interaction and cooperation at work or at school; whether one prefers to ask other people for information or to find out by means of literature, internet search, etc.) In Kolb's Learning Style Inventory (Kolb, 1985), the diverger, in contrast to the converger, assimilator and accomodator, is characterized by the preference to work in cooperation and dialogue with others and to engage emotionally in tasks and materials.

Common to these three tests, as concerns the social aspects, is a focus on an individual's direct social behavior and approaches towards real life social contexts. The person orientation assessment instead focuses on attitudes to *represented* social contexts and on an observer's – rather than an actor's – experiences of social information. The focus is not on social behavior and interaction with other actors in real life.

ISSUES ADDRESSED

In a study by Gulz (2002), a slight correlation was found between degree of person orientation as assessed by the questionnaire, and preference for a socially enriched material over a not socially enriched material in a CD-ROM-prototype. In the present study we again performed a preference study, this time complementing it with a study of learning effects in terms of memory retention, both in a free recall situation and with the help of cues. Predictions that were tested were

i) that subjects with high degree of person orientation would tend to prefer the socially enriched format over the not socially enriched format, and that the converse would be true for the subjects with low degree of person orientation

ii) that subjects with high degree of person orientation would tend to remember more items presented in a socially enriched format on a free recall test than those with low degree of person orientation

iii) that subjects with high degree of person orientation would be more helped by cues taken from socially enriched format in order to remember material than students with low degree of person orientation.

METHOD

Participants

Participants were 45 undergraduate students at a Swedish university (25 women and 20 men, mean age 26,4) who were taking a course on learning and information- and communication-technology (ICT).

Materials

The materials consisted of

– a pretest questionnaire regarding person orientation, described above

– two different study materials M1 and M2, each of which came in two different formats: a socially enriched format and a neutral format

– four different cue sheets based, respectively, upon the socially enriched format of M1, the neutral format of M1, the socially enriched format of M2 and the neutral format of M2

The two study materials, M1 and M2, each contain 6 short texts on the use of information technology for pedagogical purposes, which was the topic of the course that the students were taking. In the socially enriched versions – M1**S** and M2**S** – each text is associated with a particular person. There is a photo in black-and-white of the person with name, age and profession (for instance "Peter Bergman, 37, has a long career as a study counselor") and some biographical data (for instance, "In his spare time, he writes articles on computer use at school, and is the father – and football coach – of three children.").

In the neutral versions[1] – M1**N** and M2**N** – each text is associated with a particular, physically located, institute. On a black-and-white picture of a map, a country is marked, the name of the department or institute is written, and some data about it are given (for instance, "The school of education in Stuttgart is located in an old building that was saved from the large fire in 1876.").

Below each text, in all four versions – M1**S**, M2**S**, M1**N** and M2**N** – a few questions are written, in which the student is asked to evaluate to what degree he or she finds the proposal or theme familiar, and to what degree he or she finds it interesting. The main purpose of this is to ensure that students perform some processing of the text. Prior to the study, the material had been iteratively tested and revised in another student group in order to ensure the following: that none of the people in the photos nor their names were familiar; that the judgments of familiarity of the different themes were relatively similar; that the judgments on how interesting one finds the different themes were relatively equal. The questionnaire described above gave additional data to ensure that the material had these properties.

Procedure

Pretest

The students had earlier during the semester completed the person orientation questionnaire together with some other cognitive style and learning style tests. The mean score on the person orientation questionnaire was 32,33 (SD=6.3.). On the basis of this pretest, the 15 subjects with highest scores (>=35) and the 14 with lowest scores (<=29) were selected to be included in the study.

First session

The first session took place with the class split in two sections, with a teacher in each section, who also took the role of experimental leader. The students were instructed that they were to work in study groups of 3-4 students during most of the morning. The study groups, which had been composed beforehand by the teachers/experimental leaders, were assigned different places in a large room and in smaller study rooms. (Also on other occasions, the students were grouped into study groups by teachers.) All members of any particular study group got the same version of the study material. The 15 selected subjects with highest scores on the pretest had been distributed among the groups, so that 3 got the M1**S** material, 3 the M1**N** material, 3 the M2**S** and 4 the M2**N** material. The 14 selected subjects with lowest scores on the pretest had been similarly distributed in the study groups, with the exception that 3 – not 4 – got the M2**N** material.

The students were told that the work would start with an individual task, which was to be initiated that day and returned to in class the next week. They were instructed to write their names on the sheets and to work individually with the materials.

A teacher and a teacher assistant were present in each of the class halves, and when all students in a study group had finished, the teacher or teacher assistant collected the sheets and distributed a second sheet to the students. The groups that had just completed M1S now got M2N, and vice versa. The groups that had just completed M1N now got M2S, and vice versa.

The students were instructed to proceed in the same way with the second study material. All students thus got one of the materials, M1 or M2, in a neutral format, and the other in a socially enriched format. When all students in a group had finished work with the second study material, it was checked that the names were written on the sheets, and the teacher and teacher assistant collected all sheets. The students were finally told that this task would be continued at a later date and that they would now go on to the group work.

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[1] I.e. neutral with respect to social and personrelated information.

Second session – post test task

Exactly one week later the two halves of the class with teachers and teacher assistants were again in the same classrooms. The students were instructed that they would continue work from last week, starting out with a memory test. The students were placed in the same groups as previously, but now all in a class half were in the same room. Two students were absent, but neither of them belonged to the group of the 29 selected students.

Each student was provided with two blank papers, and the students were orally instructed to write down as much as they could remember from the materials on computers and education that they had been working with last week. When all students had finished, they were told to write their names on the sheets and place them on the corner of the desk.

Then two new sheets were distributed to all students. These sheets were based on M1**S**, M1**N**, M2**S** and M2**N**, where the central content, that is the texts on computers and education, was eliminated, but the rest of the information was left. Each student got the counterparts to the sheets they had been working with a week ago. They got the sheets in their hands and could themselves put them in any order they liked on the desk. The oral instruction was now to write down anything new they remembered from the materials from last week with the help of these sheets, and to write their names on the sheets. When the task was completed, the sheets were collected.

A final assignment consisted of answering the following three questions, written on a final sheet that was handed out to everyone:

1. Did you prefer the one or the other of the two kinds of sheets that you were working with a week ago: the one with maps and descriptions of buildings, or the one with photos and descriptions of people? Chose one of the following five alternatives.

   a) I preferred the map & building version considerably more

   b) I preferred the people version considerably more

   c) I preferred the people version somewhat more

   d) I preferred the map&building version somewhat more

   e) I did not prefer one over the other

2. For answers a)-d): Why did you prefer that version?
   For answer e): Why did you not prefer one over the other?

When the final assignment was completed, it was time for debriefing. The idea and purpose of the study was described. Early on in the debriefing, it was declared that the material would be handled with full respect to the anonymity and integrity of the participants.

Scoring of post test

In the free recall test an answer was scored 2 if the content of the theme or argument as a whole was remembered. An answer was scored 1 if about half of the content was remembered, and scored 0,5 if some but less than half of the content was remembered. If information relating to the format as such as opposed to the content (e.g. "there was a lady with long hair saying something"), was remembered, this scored 0. The total score for each material, M1 or M2, could range from 0 to 6, as a material contained three themes.

In the cued memory test, each answer, or part of answer, that added information to the free recall test was scored: a new theme or argument remembered as a whole scored 2, roughly half of the content scored 1, and some but less than half of the content scored 0,5. Thus in the cued memory test the total score for each material, M1 or M2, could again theoretically range from 0 to 6.

Two coders coded the results of the free recall test and the cued memory test of the 29 participants. In total 348, including 232 blank, answers were scored. There were 31 instances of disagreement between the coders (5 on whether an answer would score 1 or 2; 17 on whether an answer would score 0,5 or 1 and 9 on whether an answer would score 0 or 0,5). Consensus was reached after discussion.

Preference for one or the other format was coded on a 5 point scale from strong preference for the neutral format (-2) up to a strong preference for the socially enriched format (+2).

RESULTS

No effects of order sequence in presentation of material were shown, thus all data were collapsed into one analysis.

Free recall

In figure 1 the results of free recall of themes from both types of format, grouped by high P-value vs. Low P-value, are displayed.

Reproduction of themes in neutral format

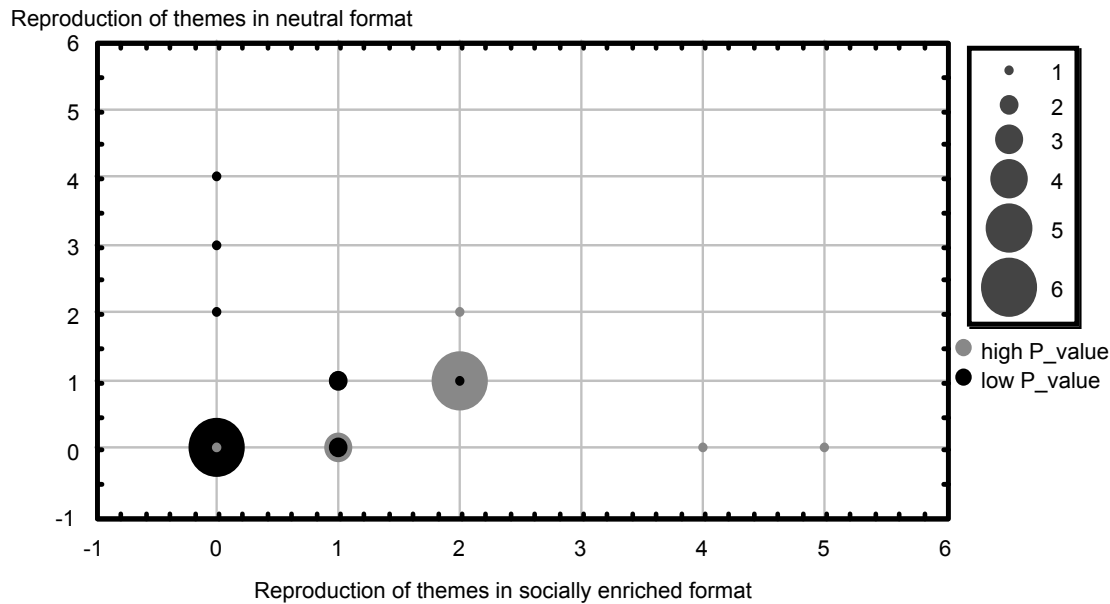**Reproduction of themes in socially enriched format**

FIGURE 1: Frequency scatterplot of reproduction of themes in both types of format - grouped by high P_value vs. low P_value

The effect of person orientation (low, high) on the free recall (number of reproduced items) for the two different formats (neutral and socially enriched) was analyzed statistically: In two separate Mann Whitney U-tests the effect of person orientation on reproduction of the socially enriched material and the socially neutral material respectively was tested. See tables 1 & 2.

The analysis of themes recalled in the socially enriched study material revealed that subjects with high scores on the person orientation questionnaire, High-P-subjects, remembered significantly more than did subjects with low scores on the person orientation questionnaire, Low-P-subjects, from the themes in the socially enriched study material. $Z=-3.38$, $p<.001$ (see table 1).

Comparing High-P-subjects' and Low-P-subjects' retention of themes in the study material with neutral format, there was no significant difference. $Z=-0.63$, $p>.05$ (see table 2).

	1st quartile	median	3rd quartile
Low-P-subjects	0	0	0,875
High-P-subjects	1	2	2

TABLE 1. Free recall of themes in socially enriched material.

	1st quartile	median	3rd quartile
Low-P-subjects	0	0	0,875
High-P-subjects	0	1	1

TABLE 2. Free recall of themes in neutral material.

Cued memory

Here the effect of person orientation (High-P-subjects vs. Low-P-subjects) on the cued recall (number of additionally reproduced themes) for the two different formats (neutral and socially enriched) was analyzed: In two separate Mann Whitney U-tests, the effect of person orientation on (additional) reproduction of the socially enriched material and the socially neutral material respectively was tested. See tables 3 & 4.

The analysis revealed that High-P-subjects increased their memory performance, when given cues from the socially enriched materials, significantly more than did Low-P-subjects. $Z=-3.32$, $p<0.1$ (see table 3.)

There was no significant difference between the groups with respect to the increase in memory performance when given the neutral formats as cues. $Z=-1.33$, $p>0.5$.

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	1st quartile	median	3rd quartile
Low-P-subjects	0	0	0
High-P-subjects	0,75	1	1

TABLE 3. Increased reproduction in cued recall: socially enriched format.

	1st quartile	median	3rd quartile
Low-P-subjects	0	0	1
High-P-subjects	0	0	0

TABLE 4. Increased reproduction in cued recall: neutral format.

+ preference of socially enriched themes
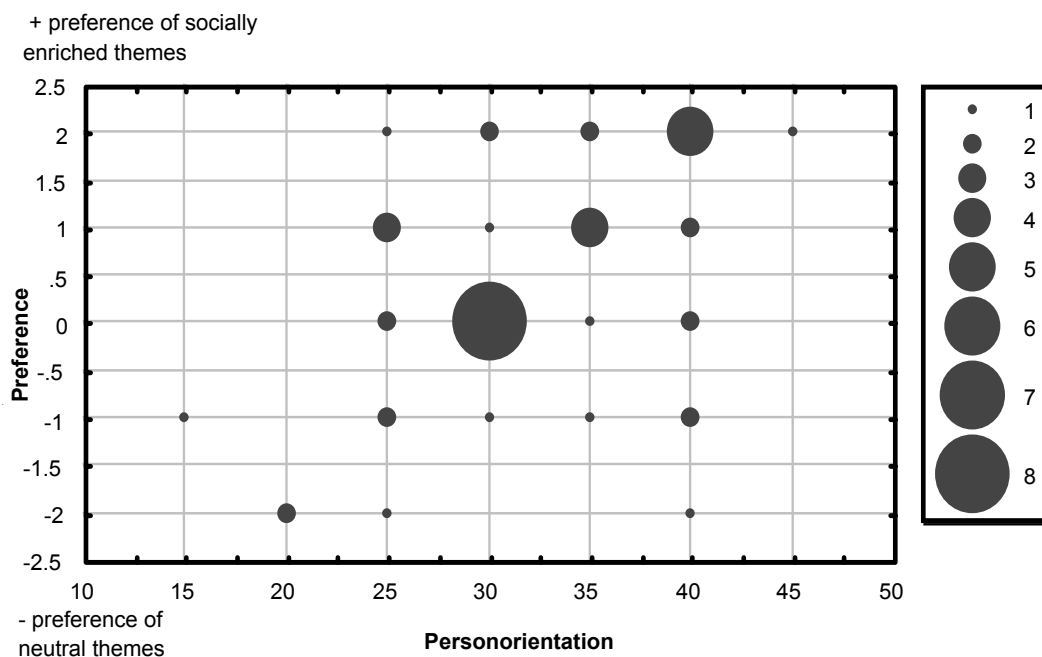
Format preferences: Figure 2 displays the preferences – socially enriched format or neutral format (with preferences given on a 5 point scale) – vs. degree of person orientation according to the questionnaire.
Frequency scatterplot of preference of material vs. degree of person-orientation according to questionnaire

Again, with a Mann Whitney U-test there is a tendency to a difference. High-P-subjects tend to prefer the socially enriched format over the neutral format more than Low-P-subjects do. Z= -1.88, p = .06 (see table 5).

Many of the motivations given to the preferences relate to the social enrichment: 13 out of the 15 motivations given by subjects who prefer the socially enriched format refer to the social format (e.g. "It is more interesting to know more about the people, who they are, what values they have, etc.", "I am curious about people", "People stick easier in one's memory" and "You learn more when there are people; they make it more personal and fun, and learning is supposed to be fun.") and also 5 out of the 8 motivations given by subject who prefer the neutral format relate to the social enrichment (e.g. "The people version seems less factual", "I'm not interested in people", and "People are more disturbing")

	1st quartile	median	3rd quartile
Low-P-subjects	-1	0	1
High-P-subjects	0	1	2

TABLE 5. Format preferences. Preferences on a 5 point scale (socially enriched format – positive values; neutral format – negative values.)

Discussion

The results of the study indicate that social enrichment of a learning material has quite varying effects on individuals, in terms of both motivation and performance. Social enrichment is appreciated by some learners, but not by others, and seems to have positive effects on memory retention for some learners but not for others.

There is also evidence that the differences, in motivation as well as in memory effects, correlate with what we call person orientation. An uncertainty in the correlation between person orientation and memory performance lies, however, in the generally low degree of content remembered: Whereas the maximum score on free recall for a material, M1 or M2, would be 6, the mean score for all participants on the items in the socially enriched versions is below 1. The two rather exceptional scores 4,5 and 4, were obtained by participants in the group with high person orientation. To what group such scores belong has a main effects on the results. Some singular exceptionally high scores obtained by participants in the group with low person orientation could drastically change the result.

In a follow-up study with a different student group, we aim to improve the total amount of material recalled. More instructions to process the material will be added, and the interval between processing and memory test will be radically shortened. In the present study the interval is a whole week. The reason for this was to integrate the study smoothly in the course given[2]

GENERAL DISCUSSION

Given the exploratory character of this study, it is important to compare the results to other studies addressing similar issues.

Socially enriched material and variability in user attitudes

Höök et al. (2000) studied user responses and attitudes to a socially enriched information material. The material consisted of a collection of about 40 sites on film production from the web, and the social enrichment consisted in the addition of two characters, Agneta and Frida, who "sit on the desktop" watching the browser more or less as if they were watching television, commenting the pages seen, as well as browser malfunction and error messages. Agneta and Frida are designed to express "personality", "attitudes", and "inner lives". By comments that allude to their own everyday lives, they "provide […] the users with their 'back story'"

(ibid. p.198). Höök et al. (ibid) use the concept *a character-enhanced system*.

By means of a number of measurements and methods, Höök et al. (ibid) attempted to assess users' experiences of the Agneta&Frida system, as well as their behaviour: to what extent did users find that the characters made the situation nicer, did they think that the characters were fun, did the characters stimulate explorative behaviour, did users want to use the character enhanced system again?

The majority of the 18 participants indeed seemed to appreciate the characters, finding them fun and nice. But some users, on the other hand, became very irritated and felt that the characters got in their way. Participants who appreciated the characters were also, not surprisingly, more willing to use the system again.

Rickenberg & Reeves (2000) studied the "likeability" of three different systems: one without an animated character, one with a character that does not interact much with the user and a third system with a character that monitors and interacts with the user to a greater extent. The "likeability" was assessed through a number of Likert scales regarding levels of enjoyment, fun, and boredom as well as willingness to recommend and expected future use of such a system. The participants in the study belonged to two groups, participants with *high internal locus of control* who tend to think that they control their own success, and participants with *low internal locus of control* who hold a general belief that others control their destiny. The results showed large variability in the participants' appreciation of the systems, where locus of control turned out to have a significant main effect. Users with an internal orientation liked the systems more than those with an external orientation. The largest difference was found with the system that was not socially enriched. This system was significantly more liked by users with internal control orientation than by users with external control orientation. The difference between the two groups then decreased for the system with an idle character and decreased even more for the system with the monitoring character. Thus, whereas participants with internal control orientation liked the system that was *not socially enriched* more than the system with a monitoring character, and as much as the system with an idle character, participants with external control orientation, to the contrary, liked the *socially enriched systems* more, both when the character was idle, and – in particular – when the character was monitoring. The authors suggest that the concept of locus of control may be of help to separate those who like from those who don't like animated characters.

In a study by Gulz (2002) participants were asked to chose between two interfaces – a socially elaborated interface and a spatially elaborated interface – to a system. About one third of the 24 participants

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[2] Which can also be considered advantageous as concerns ecological validity of the learning situation.

preferred the socially elaborated interface, about one third preferred the spatially elaborated interface, and about one third expressed no preference. The participants were also asked to give reasons for their choices. From the motivations given, it was clear that social enrichment is appreciated by some (e.g. "I chose it because it is more personal, about people, individuals", "I find a social context more stimulating to explore" and "It's more natural and easy for me to relate to the people than to the park") and disliked by others (e.g. "I don't want to know things about those people" and "The people are only complicating things").

None of the studies mentioned above takes place in a pronounced learning context. Yet, given that exploration of an information space is a learning element and that presentation of material as well as guidance through material are teaching elements, the studies have relevance for learning contexts. These studies, as well as the study presented in this article, show that there are individual differences in attitudes towards socially enriched material. There is also some indication that such differences can be related to cognitive styles (person orientation) and / or other individual traits (control orientation).

Socially enriched material and variability in memory performance

Results on variability in memory performance with respect to socially enriched material are more difficult to find. The few studies that there are focus not on individual variability, but on differences between groups, specifically between the group that does, and the group that does not, use a material or system that is socially enriched in some way.

The study by Höök et al. (2000), for example, addressed the question of whether subjects working with the character enhanced system and hearing the characters, Agneta and Frida, comment and make jokes about web pages, would remember web pages better than subjects working with the system without character enhancement. There was, however, no difference between the two groups in terms of how much they remembered. Also there was no difference in performance between pages with or without comments from Agneta & Frida. Interestingly, though, subjects who had used the character enhanced system were able to accurately recall the comments that the characters had made. In other words, the memory retention of the added social format or framing was high, but did not support higher memory retention of the web page content. This topic or problem is debated with respect to animated pedagogical agents (e.g. Moreno et al., 2001; van Mulken et al., 1998), and may be generalized: is there a risk that social enrichment of various kinds distracts the user from the content or message rather than produce positive learning effects?

Moreno et al. (2001) compared the performance on a learning task in two different groups: one group using a system with a social agent and the other group using the system without an agent. As in the Höök et al. study (ibid), no difference was found between the groups on retention tests. However, there were significant differences on transfer tests: the group that had been working with the socially enriched system outperformed the group that had used the neutral system. The study did not, however, address individual variability within the two treatment groups.

In Sum

The results of the study presented in this paper, as well as results of related studies, show a significant individual variability in attitudes to socially enriched learning material. The study presented also points to individual differences as to whether socially enriched material supports memory performance or not. In addition, the results of the study presented indicate that the construct 'degree of person orientation' may be meaningful in describing the variability both in attitude and performance. However, more studies are called for in order to chart out and illuminate the variability and the possible style constructs, or the like, that are associated with the variability.[3]

A pedagogical implication of the result is that we cannot hope for social enrichment of learning materials to be an instructional panacea. That is, cognitive scientists or instructional scientists will not be able to propose social enrichment as a general recommendation or guideline to designers of instructional material. Rather, designers ought to be made aware of the individual variability in this respect. This is also one of the main conclusions of Rickenberg and Reeves' (2000) article. In discussing animated agents, they argue that interface designers should be more concerned with making decisions concerning whether or not to use animated characters, and that they should base their decisions on who the user is, considering relevant traits such as control orientation. According to this proposal, it is the designers of instructional materials themselves who chose to include or exclude social enrichment. A more attractive design alternative, in our view, is that both options, with and without social enrichment, are offered, and that the learner/user is allowed to make the choice. This is the position that Laurel (1997) takes when she discusses personification of interfaces, and exemplifies by animated agents: "good interfaces [should] allow for more than one way of doing things […]. Only users who want to use agents should have them, other should have other choices." (Laurel, ibid. p 209.)

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[3] Furthermore it should be observed that the class of socially enriched learning material is not homogenous. Social enrichment as ornament, in contrast to social enrichment, where a social context is integrated with a content and used to structure and frame it, are likely to influence motivation and performance differently.

It is, of course, not possible to take all aspects of individual variation into consideration when designing a learning material. We find, however, that social enrichment is an aspect worth considering with respect to flexibility. Attitudes and emotional reactions – liking and disliking – seem strong, and therefore there is reason to believe that it is an aspect of learning materials that can affect the whole learning situation and learning processes for an individual.

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