THE INFLUENCE OF LEARNING MANAGEMENT SYSTEM COMPONENTS ON LEARNERS' MOTIVATION IN A LARGE-SCALE SOCIAL LEARNING ENVIRONMENT

Completed Research Paper

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Abstract

Blended learning is becoming increasingly important in information systems research and education. One major drawback is to foster student's motivation to actively participate in blended learning environments. There is still little understanding about the perceived value of incentives and components of learning management systems. Therefore, we investigated the perceived value of incentives. Furthermore, we analyze incentives' and LMS components' influence on learner motivation during a large-scale lecture. Based on the theoretical background of the ARCS model, we found that the perceived value of self-tests and forums have a substantial influence on learners' motivation. In particular, the findings suggest that a clear communication of the components' benefits is likely to positively influence learners' attention, confidence, and perceived relevance. We also show that lecturers can influence perceptions of components by means of incentives. These results are valuable to develop LMS environments.

Keywords: Incentives, higher education, blended learning, satisfaction, learning management system

Introduction

Internet-based education is becoming increasingly important and is expected to change higher education as a whole (Edgecliffe-Johnson and Cook 2013). This is a result not only of improvements in information and communication technologies, but also due to a growing number of highly ranked universities investing heavily in online courses, which exerts much competitive pressure on other universities worldwide to foster e-learning technologies (Edgecliffe-Johnson and Cook 2013). Not only purely online-based education (Chen at al. 2010), but also blended learning environments are becoming increasingly important (Halverson et al. 2012). Blended learning environments combine face-to-face and online learning (for an overview of the definitions, see Halverson et al. 2012). Numerous studies show that blended learning increases student satisfaction compared to traditional face-to-face approaches and pure online courses (for an overview, see Owston et al. 2013). We focus on such blended learning environments since this teaching strategy seems "likely to emerge as the predominant [learning] model of the future – and to become far more common than either [face-to-face lectures or online learning] alone" (Watson 2008, p.3). Blended learning might define future higher education and is thus often perceived as transformative (Garrison and Kanuka 2004; Halverson et al. 2012) because it is universally applicable in fields such as IT, teacher education, medical education, business, and engineering, to name a few (Halverson et al. 2012, for an overview of advantages of blended learning approaches see Owston et al. 2013).

Lecturers who apply traditional face-to-face teaching modes in large-scale courses are confronted with specific problems, because students are less likely to interact with the lecturers. Lectures are also less efficient because they are not flexible and not oriented to each individual (Wegener and Leimeister 2012a,b; Wegener et al. 2012). Students seem more passive and are less likely to engage in own problem-solving tasks; instead, they are more likely to consume the solution presented by the lecturer. There is rarely incisive discussion during large-scale lectures. This is problematic because: (1) students often do not recognize their strengths and weaknesses early on since they do not engage in own problem-solving, and (2) they rarely discuss open questions during large-scale lectures or tutorials. Nevertheless, in line with the constructivist approach, students should be active learners instead of passive consumers (Andersson et al. 2009, Beckem and Watkins 2012) and should individually construct their understanding of the course material. Garrison et al.'s (2000) research on 'active learning' argues in the same vein (for an overview see Bell and Kozlowski 2008 or Shieh 2012). Two main challenges arise from these specific characteristics of large-scale courses: (1) learners should be motivated to practice content from the course and to engage in own problem-solving, and (2) the quality and quantity of lecturer-student interaction need to be improved.

Blended learning seems to be an appropriate approach to address these problems in large-scale settings (Wegener and Leimeister 2012b), since it seeks to improve the quality and quantity of interactions and may thus increase students' motivation and engagement throughout a course (Garrison and Kanuka 2004; Klein et al. 2006). As stated above, we define blended learning as a combination of traditional face-to-face lectures and an e-learning system. In this paper, we focus on two common LMS components, namely self-tests and online forums. Self-tests are exam-like questionnaires. Learners are asked to answer questions that relate to the content of the face-to-face lecture and are provided with feedback on their learning success immediately after completing the self-test. Online self-tests thus enable learners to assess their understanding of the course content and to identify their strengths and weaknesses. Online forums are communication platforms that enable students to discuss open questions (e.g., mistakes from the self-test, questions on the lecture, etc.). Implementing an online forum is likely to lower the communication barriers between the students and lecturer, or among the students themselves. Often, several of these functionalities are integrated into a learning management system (LMS). Following Al-Busaidi (2012, p.12) LMS "not only provides academic institutions with efficient means to train and teach individuals, but also enables them to efficiently codify and share their academic knowledge. [...] LMSs, or e-learning systems, are used by some academic and technical training institutions to support distance learning (pure exclusive e-learning), while others use it to supplement more traditional ways of teaching (blended learning)."

While these potential benefits of LMS adoption seem clear, a deeper understanding of these components is necessary to better address students' needs. It is also essential to set the right incentives. Online learning groups often do not constitute a 'real' community but can rather be described as a network of inquiry (Waters and Gasson 2012). Most blended learning communities are constructed and not 'naturally grown' (Garrison and Kanuka 2004). Lecturers implementing blended learning environments therefore need to find ways to motivate learners to participate. In this context, different components of LMS may have a positive impact on learner motivation. For instance, the high perceived value of a forum and/or self-test might positively influence learners' motivation. Additionally, the perceived value of incentives (such as monetary prizes) might positively influence perceptions of the abovementioned LMS components. However, studies also often report that students avoid LMS components (such as online-self tests and online forums) that require active participation (Gidion and Grosch 2012). Knowledge on how to influence perceptions of components and their ability to influence learners' motivation is needed to improve students' adaption of these systems. To date, there has been a strong need for empirical data about the effects of certain LMS components and incentives on learner motivation.

To help fill this research gap, we investigate the influence of the perceived value of alternative incentive types (social media components such as 'likes,' financial incentives, and extra points towards the final exam) on the evaluation of an online forum and an online self-test. We also assess how a forum's and a self-test's perceived value influences learner motivation. Learners' motivation was conceptualized and operationalized according to Keller's (1984, 1987a, b) ARCS approach. We focus on the context of a large-scale, blended learning environment aimed at entry-level classes. Learners in such classes are usually highly heterogeneous, meaning that their interests are likely to differ greatly. For example, some students who major in this specific course might initially have a higher intrinsic motivation than others who only need the course as a requirement for other courses. In the context of this study, the majority of learners belong to the latter group (usually about 75% of the students of this course do not major in the respective field). Motivating students to actively participate in the lecture is therefore important.

The article proceeds as follows: First, we provide a literature review, then present the ARCS approach which we use as a theoretical framework for our study. We then derive our hypotheses based on previous research. Subsequently, we describe the estimation technique, our empirical study setting, and present the results. The paper concludes with a discussion of how to improve blended learning scenarios as well as an outlook on further research.

Literature Review and Motivation for this Study

Two types of instruction strategies are commonly used in higher education: direct and interactive instruction. Direct instruction is the teaching mode generally used in lectures. This approach is lecturer-centered, since he or she is responsible for providing students with knowledge. Communication is mainly a one-way street in that lecturers define the structure and select the content. In contrast, interactive instruction encourages student participation. Students should discuss and share information among each other and, ultimately, solve complex course-related problems. Interactive instruction modes are thus based on students' active participation. Interactive instruction modes are commonly applied in tutorials and class discussions (Chen et al. 2010; Wu et al. 2010). Activating all students is a reasonable goal in a setting with small student groups. However, in large-scale classes, i.e., with more than 100 or even 500 students, it seems impossible to ensure that each student actively participates in a course based on interactive instruction.

However, as noted, blended learning might be a possible solution. We focus on blended social learning environments, which involve a blended learning environment that is further enriched by social media components, such as peer-to-peer-based evaluation tools (e.g., 'likes'). Such systems are potential tools that may enable lecturers to successfully combine direct and interactive instruction modes. While direct instruction could be applied in lectures, interactive instruction is relevant in tutorials. Using interactive LMS components such as online discussion forums and self-tests enable students to actively participate in and to discuss lessons with one another (and with the lecturer). These technologies have the potential to reduce communication barriers, help develop teamwork skills, increase learners' flexibility, and enable more individualized communication with students (i.e., they decide when to participate and can ask as many questions as they like and when they like, (Garrison and Kanuka 2004; Waters and Gasson 2012; Wegener and Leimeister 2012b; Wu et al. 2010). In sum, blended social learning may increase students' satisfaction (Edgecliffe-Johnson and Cook 2013).

Blended social learning is becoming increasingly relevant and accepted by learners and lecturers (Edgecliffe-Johnson and Cook 2013), since the students of today use internet technology and social media as primary communication channels. Prosperio and Gioia (2007) refer to these learners as the 'virtual generation.' These students are used to online learning systems. Technological barriers are therefore less relevant today (Prosperio and Gioia 2007; Chen et al. 2010). New technology was often appealing in the past. However, as students use these technologies in their everyday lives, the novelty is likely to wear off. Stimulating and motivating students is therefore a challenging task (Song and Keller 2001). A recent study in Germany has shown that students still avoid LMS components (such as online self-tests and online forums) that require active participation and that satisfaction with these instruments is fairly low (Gidion and Grosch 2012). It is therefore highly relevant to assess the influence of the perceived value of incentives on the perception of LMS components and several types of incentives on learner perceptions of a course (Chen et al. 2010) and, ultimately, on motivation in order improve blended learning environments.

Assessing Learners' Motivation: The ARCS Approach

The ARCS approach (Keller 1984, 1987a,b) is commonly used in research (see Keller 2010) and serves as an initial framework for exploring student motivation drivers. This approach is widely accepted and has been empirically tested in numerous studies (e.g., Huang et al. 2006; Keller 2010). The ARCS model consists of the four dimensions that constitute learner motivation: attention, relevance, confidence, and satisfaction (hence, ARCS). ARCS strategies seek to stimulate these four dimensions, for example, (1) by adapting the learning material or lecturers' instructions, (2) by using new instruments (components), and (3) by setting the right incentives to increase or sustain positive learner perceptions of the course material and ultimately their motivation (Huang et al. 2006; Keller 1984). Most previous studies address the research question of how to adapt learning material (see Keller 2010 for an overview; Song and Keller 2001 as well as Astleitner and Koller 2006 assess the influence of adaptive instruction material on learner motivation in an e-learning environment). We focus on aims, (2) and (3) because, on the one hand, we are not aware of any research on the influence of perceived value of LMS components (e.g., online forums and self-tests) and the perceived value of incentives (e.g., extra points, financial incentives, or 'likes' (similar to Facebook) on learner motivation. On the other hand, we expect value perceptions of these components and incentives to significantly influence learners' motivation.

First, we briefly describe each of the four ARCS elements and then explain how to influence them based on LMS components and incentives. Attention refers to learners' response to educational instruments or incentives with respect to learners' arousal and curiosity. Relevance describes learners' ability to derive practical importance from learning material. It is therefore essential to demonstrate the practical applicability of course content and to match it to the learners' motives. In sum, course knowledge should fit the students' future job requirements or should be perceived as intrinsically interesting. Confidence relates to learners' expectations with respect to being able to successfully learn course content and pass exams. Confidence is thus based on feedback to learners' performance. Satisfaction is an overall aggregate measure of attitude towards the learning task. It is based on learners' overall attitudes about the blended learning environment or the course (Huang et al. 2006; Keller 1987b; Keller and Suzuki 2004).

Keller (2006) suggests that assessing learner motivation is fairly simple. Keller (1993) proposed 36 items with which to measure the ARCS items (also see Huang et al. 2006, Keller 2006). Twelve items focus on attention, nine on relevance, nine on confidence, and six on satisfaction. Researchers can thus assess the four ARCS elements separately. Alternatively, the overall motivation can be computed by simply summing up all the single-item values (Keller 2006). These approaches might be problematic for two reasons. First, when assessing student motivation, any difference in the number of items might act as an implicit weighting factor. For example, attention is measured on 12 items, while satisfaction is surveyed on only six items. As a result, attention might have more influence on the overall motivation results than satisfaction.

Keller (2006) unfortunately does not explain why some dimensions were measured based on six, nine or 12 items. Second, previous research has suggested that the four ARCS dimensions are not independent from each other (Cook et al. 2009). Furthermore, in one of his papers, Keller (1999) hypothesized that satisfaction is ultimately influenced by attention, relevance, and confidence. Satisfaction is a typical outcome of learning processes (Andersson et al. 2009; Wegener and Leimeister 2012a, b; Wegener et al. 2012; Wu et al. 2010; Yu et al. 2010). Thus, in line with previous research, we expect that overall satisfaction with a course is influenced by the course's ability to increase learner attention, by demonstrating the relevance of course material, and by increasing learner confidence.

Furthermore, we expect that perceived personal relevance will influence learner attention (e.g., information perceived as less relevant to an individual is less likely to stimulate his or her curiosity). This idea is in line with research on perceptual processes in consumer behavior. Previous research has found that only a fraction of information that people face is ever processed. Instead, people will first interpret the meaning (relevance) of a stimulus based on their experiences, which then influences their attention to a stimulus (Solomon et al. 2010). We thus expect that the perceived relevance of a course's material will influence how much attention learners pay to it. Figure 1 summarizes the basic ARCS model used in this study.

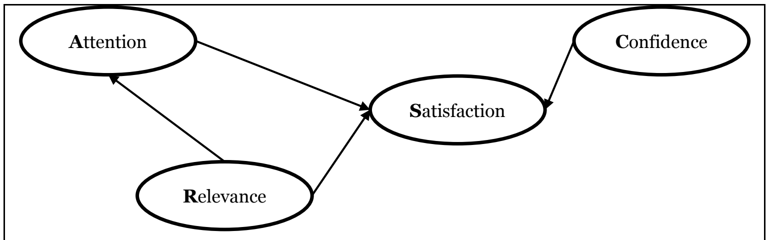

Figure 1. Modified ARCS Model

It is important to note that the ARCS model refers to students' internal states. It is therefore not possible to directly influence their motivation for a course. However, external factors can influence learners' motivation and, ultimately, their behavior (Visser and Keller 1990). We therefore assess the influence of external factors – such as the perceived value of online self-tests, online forums, as well as incentives (such as extra points towards an exam and financial incentives) – on learner motivation.

Theoretical Foundation on LMS Components and Incentives

Previous research has shown that LMS components, such as self-tests and online forums, are likely to improve learners' success. However, numerous studies (e.g., Gidion and Grosch 2012, also see Lust et al. 2013 for an overview) show that learners tend to avoid self-tests (e.g., quizzes) and online forums. Lust et al. (2013) assume that students lack motivation to actively use these LMS components. Behavioral economics research provides additional explanations for this limited use of LMS components. For example, students might feel that they already understand the course content well enough although they do not (overconfidence effect), they might underestimate the time needed to successfully pass the exam (cognitive and time-related self-control systems often fail). Moreover, group dynamics may influence the usage intensity of LMS components, i.e., if only few students actively use them, other students may believe that their value is rather limited ('following the herd' effect). We therefore present research findings on overconfidence, failure of time-related self-control systems, and group dynamic effects. Besides research on higher education, these findings enable us to formulate hypotheses on how LMS components influence learners' motivation. Moreover, these findings suggest that students may need an incentive to actively use these LMS components.

Overconfidence, Importance of Feedback, and Learner Time Preferences

Research in behavioral economics has shown that the overconfidence effect influences people's behavior (Camerer and Lovallo 1999) and that unrealistic optimism is one of the most robust effects in psychology (Armor and Taylor 2002; Sharot et al. 2011). The overconfidence effect (or optimism bias) proposes that people tend to evaluate themselves as better than they actually are. People also tend to underestimate risk and are too optimistic, even if failure would have a high impact on their lives (see Thaler and Sunstein 2009). In the context of learning, students are likely to believe that their knowledge is better than it actually is and may underestimate the risk of failing their final exam. However, previous research has shown that students who are aware of their own capabilities (Buehler et al. 1997) are more confident when solving a task and less likely to be biased by unrealistic optimism (Armor and Taylor 2002). It is therefore essential to provide learners with immediate feedback on their actual strengths and weaknesses so as to avoid biases due to overconfidence (Thaler and Sunstein 2009).

Many researchers now consider it impossible to learn without immediate and clear feedback (for an overview, see Thaler and Sunstein 2009), i.e., people are not able to evaluate their actions via feedback. Similarly, Chen et al. (2010), Huang et al. (2006), and Wang and Wu (2008) argue that feedback is an important way to influence students' behavior and to improve their knowledge. In sum, providing feedback is likely to be an effective option to improve learners' success. Online self-tests provide such immediate feedback, i.e., students are asked to answer several course-related questions, which are evaluated by the system. Students get immediate feedback on these tasks and are ultimately able to identify their strengths and weaknesses. However, students may need an incentive to participate in such self-tests, because the perceived value of such online learning components might be too low (i.e., they might prefer to spend their time on leisure activities). We thus expect that some students might need help to value self-tests, an LMS component that aids continuous learning and that has a positive long-term effect, compared to the short-term effect of spending time on leisure activities.

Cognitive self-control systems are relevant to control peoples' resources (Huang et al. 2006; Thaler and Sunstein 2009). Time-related self-control systems are important in this research context. They seek to assign time resources to specific activities (e.g., to learning or to leisure activities) in order to maximize people's long-term utility. However, many people have problems when their time-related self-control is tested (for an overview of research findings see Armor and Taylor 2002). This especially applies to situations in which there is a time lapse between someone's behavior and the consequences thereof (Armor and Taylor 2002). Dieting, exercising, and learning are common examples of such situations. People tend to put more weight on immediate pleasure (in our context, students may prefer having more leisure time) and may thus put off learning for as long as possible (e.g., until right before an exam). Furthermore, research on the planning fallacy effect (for an overview, see Buehler et al. 2002) shows that people's predictions of the time needed to complete a project tend to be too optimistic, since they focus on a best-case scenario. For example, previous research has shown that students are likely to underestimate the time needed to complete a learning task (Buehler et al. 1994). Students may therefore be tempted to start learning too late. Incentives with a high perceived value may help them study regularly. This is important for increasing their learning success. Learners must recognize their own weaknesses in order to ask sensible questions in forums. Moreover, incentives that reward regular use of LMS components might also help stimulate a blended learning community. For example, the utility that learners derive from LMS components is potentially influenced by the respective usage intensity of other learners. If many students post questions and answers on an online forum, all of the forum participants benefit from this knowledge. Moreover, behavioral economics research (see next section on 'following the herd') suggests that learners might interpret others' usage intension as an indicator of the LMS component's utility.

To address all the above mentioned research gaps on learning behavior, we created an online self-test with specific characteristics. First, a self-test provides immediate feedback on learners' answers; this avoids effects, such as overconfidence. If a student made a mistake, he or she can immediately discuss this problem in an online forum. As noted above, we expect that some students will value self-tests while others might not immediately recognize their positive effects. We expect that those learners who value the self-test will feel more confident, as they can identify their strengths and weaknesses better. Based on this knowledge of their strength and weaknesses, students can focus on specific problems with and clarify misunderstandings about the course content. This should ultimately increase their confidence in the course. In summary, we thus expect a positive relationship between the perceived value of the self-test (i.e., immediate feedback) and learners' confidence in relation to the course. We postulate:

H1a: The higher the perceived value of the self-test, the higher the learners' confidence in the course.

Overconfidence has been shown to be a common effect in peoples' lives. Providing feedback on students' 'true' learning success might therefore be surprising to the individual; for instance, if a student expects an answer to be correct and then gets negative feedback. Previous research has found that surprising stimuli evoke attention (Solomon et al. 2010). We therefore expect that students who value self-tests are more likely to show a higher attention level.

H1b: The higher the perceived value of the self-test, the higher the learners' attention to the course.

Self-tests may also provide additional information regarding structure, content, and question types that are relevant for the final exam. We therefore expect that learners who value self-tests are more likely to be satisfied with the blended learning environment.

H1c: The higher the perceived value of the self-test, the higher the learners' satisfaction with the course.

To motivate students to actively practice in the course and not just shortly before the exam, lecturers can post self-test question pools on the LMS that are only available to the students for a limited time after each lecture. Furthermore, students might be given the opportunity to earn extra points for the final exam depending on the self-test results. In sum, by limiting the time for which a self-test is available and by enabling students to earn extra points, one might be able to 'nudge' students to learn continuously throughout lectures. Therefore, we expect that students who value the incentive extra points also place more value on self-tests.

H2a: The higher the perceived value of the extra points towards the exam, the better the learners' attitudes to the self-test.

Keller (1999) as well as Keller and Suzuki (2004) assume that extrinsic rewards (such as extra points) influence students' overall satisfaction with a course. Neither author limits this assumption to a specific context; thus, this relationship should be relevant for any learning environment, including blended learning environments. We therefore expect that learners who value extra points more will also be more satisfied with a course.

H2b: The higher the perceived value of the extra points towards the exam, the higher the learners' satisfaction with the course.

Feedback can be provided to learners based on self-tests or other students' questions or comments in an online forum. Students can get feedback from other students or from lecturers by asking questions (e.g., by discussing open questions and problems in a community) or merely by observing debates in the forum (Waters and Gasson 2012). Students also get feedback by answering other students' questions, i.e., such 'learning through teaching,' peer creation, or collaborative learning approaches may increase interactivity, foster critical reflection, and increase students' communication skills (Andersson et al. 2009; Damon 1984; Eryilmaz et al. 2010; Huang et al. 2006; Topping 2005; Waters and Gasson 2012; Wegener and Leimeister 2012a,b). Furthermore, based on other students' responses to their posts and lecturers' feedback, they are better able to assess their own strengths and weaknesses. Communication barriers are likely to be lower in an online learning environment as students perceive themselves to be less the center of attention than in the face-to-face setting in a traditional tutorial. Interaction is likely to be more intense in an online forum than in traditional tutorials (i.e., students have the opportunity to ask more questions, for a literature overview, see Andersson et al. 2009; Chen et al. 2010; Garrison and Kanuka 2004; Waters and Gasson 2012), while interaction quality and engagement are also likely to increase (Halverson et al. 2012). Such online forums in a blended learning context may even create a stronger sense of community among students (Rovai and Jordan 2004; Garrison and Kanuka 2004). In sum, interactivity in online forums enables students to get feedback and might be more engaging than direct instruction modes. Keller (2000) expects that networking tools are likely to increase learners' attention to a course. We again expect that some students value online forums more than others, and therefore propose that:

H3a: The higher the perceived value of the online forum, the higher the learners' attention to the course.

However, we do not expect that a high perceived value of online forums to only influence learners' attention. It might also influence perceived relevance, confidence, and satisfaction. For example, students may use practical examples when discussing possible solutions to learning tasks. We thus expect a relationship between perceived value of online forums and perceived relevance of a course. Furthermore, as noted above, an online forum is one way to provide students with feedback and may help overcome the problem of overconfidence. Students who value a forum and therefore discuss learning tasks among their peers or simply read other students' comments may better enable those students to identify their strengths and weaknesses (Waters and Gasson 2012). We thus expect that students who value online forums will be more confident about their learning success than students who do not. Finally, there might be a direct relationship between learners' perceived value of the forum and their overall satisfaction with the course. Forums are likely to lower communication barriers and to increase discussion intensity and interaction with peers. Thus, forums hold additional utility for students and ultimately increase learner satisfaction. We thus expect that:

H3b: The higher the perceived value of the online forum, the higher the learners' perceived relevance of the course.

H3c: The higher the perceived value of the online forum, the higher the learners' confidence in the course.

H3d: The higher the perceived value of the online forum, the higher the learners' satisfaction with the course.

Following the Herd: The Influence of Social Media Components

Salganik et al. (2006) have shown that most human decisions are influenced by other peoples' choices. Similarly, Thaler and Sunstein (2009) show that most people learn from others' actions. Social influence is thus likely to influence students' behavior. Salganik et al. (2006) propose that information on other peoples' preferences and behavior will have a strong influence on decision-making. People are likely to conform to other people's behavior (Salganik et al. 2006; Thaler and Sunstein 2009) and tend to self-regulate their learning efforts according to those of their peers (Waters and Gasson 2012). Thus, social learning (i.e., learning from peer group interactions) may have a strong influence on learners' motivation (for an overview, see Wang and Wu 2008; Waters and Gasson 2012; Yu et al. 2010).

In the context of this study, peer-based ratings, for example Facebook 'likes,' can increase peer learning environments' efficiency (Wegener and Leimeister 2012a) since they inform students about their peers' behavior. Peer-to-peer evaluations ('likes') in social networks deeply influence people's everyday lives and are also likely to influence learners' behavior (Yu et al. 2010).

'Likes' can be interpreted as an indicator of other people's preferences. Rankings based on the number of 'likes' might also indicate a student's specific status. Such rankings might be an option to gain social acceptance from other students (Yu et al. 2010). 'Likes' and 'likes'-based rankings are expected to influence students' reading and posting behavior (Salganik et al. 2006). 'Likes' and other indicators (such as the number of posts in a forum) are also indicators of the general activity in an online community. If providing information on other learners' preferences is perceived to be valuable, we expect that 'likes' will positively influence learners' perception of an online community. We thus hypothesize:

H4a: Those learners who believe that data on the preferences of their peers (number of 'likes') is valuable information will also value the online forum more positively.

In line with Keller (1999) as well as Keller and Suzuki (2004), we expect that this extrinsic reward will also influence learners' satisfaction. We therefore expect students who value information on preferences of their peers ('likes') to also be more satisfied with the blended learning environment.

H4b: Those learners who believe that data on the preferences of their peers (number of 'likes') is valuable information will also be more satisfied with the course.

Learning Contests and Financial Incentives: A Double-Edged Sword

Learning contests and related financial incentives can be perceived either negatively or positively. For example, at first glance, learning contests might only seem relevant for a small group of top-level students. Previous research on sales incentives can be transferred to a learning context in order to explain learners' possible negative reactions to contests. Financial incentives and contests are commonly used to motivate salespeople to perform better. However, similar to students, all salespeople do not perform equally (Casas-Arce and Martínez-Jerez 2009). For instance, they could be divided into three groups: laggards, core performers, and stars (Steenburgh and Ahearne 2012). Contests are usually only relevant for the stars, since one of them is very likely to win the prize. Core performers (generally, the most salespeople) are less likely to be motivated or demotivated by contests, since they do not expect to have any chance of winning the prize (Casas-Arce and Martinez-Jerez 2009; Steenburgh and Ahearne 2012).

Such effects might also be relevant in an online learning context. Students who do not expect to belong to the top 10 students might not like such incentives. For instance, in a learning context with 500 students, only 2% have a chance to take part in the lottery when raffling the price among the top 10 students in the 'likes' ranking. In such a large-scale setting, contests might have a negative impact on students' evaluation of the online forum and the 'likes'-based ranking.

However, in contrast to research on salespeople, contests might also be perceived positively in an online learning setting. Contests are likely to increase (at least some) people's effort in a specific task (Murphy et al. 2004). For instance, top students might be more motivated to answer their peers' questions. In this context, it is important to stress the large difference between research on sales incentives and contests in an online learning context. In a sales context, only those salespeople who win the prize benefit from the competitions. However, everybody benefits from (even few) motivated students that share valuable knowledge with other students by answering their peers' questions or by discussing specific tasks. Therefore, the top students' answers might increase the overall perceived value of the forum.

In sum, the top students might have positive or negative reactions, while the remaining students, too, may have positive or negative reactions. Top students might value learning contests, which allow them to win a prize. However, activity engagement theory (Higgins and Trope 1990) suggests that offering intrinsically motivated people an award (extrinsic incentive) might reduce their overall motivation because, for example, they believe that extrinsic motivation is not necessary. Other students might feel that they have no chance of winning the price. Thus, contests might influence the perception of LMS components and motivation negatively. Conversely, they could also value such contests, as they can benefit from their peers' knowledge.

Overall, we expect that the value perceptions will be heterogeneous across the students. However, all these considerations suggest that there is a clear relationship between learning contests and learners' perceptions, i.e., if students perceive contests to be valuable, their perception will positively influence their evaluation of related LMS components (the 'likes' ranking and the online forum) and their overall satisfaction with the course. The latter assumption is based on Keller and Suzuki (2004), who propose that there is a relationship between rewards and overall course satisfaction. If the contest evaluation is negative, the perception of other LMS components and the course evaluation will also be negative.

H5a: The higher the perceived value of the learning contest, the higher the learners' perceived value of the 'likes' ranking.

H5b: The higher the perceived value of the learning contest, the higher the learners' perceived value of the online forum.

H5c: The higher the perceived value of the learning contest, the higher the learners' satisfaction with the course.

Figure 2 summarizes all the relationships that are expected to influence learners' motivation. This proposed model is based on the ARCS elements and additionally implements theoretical considerations and research findings from behavioral economics.

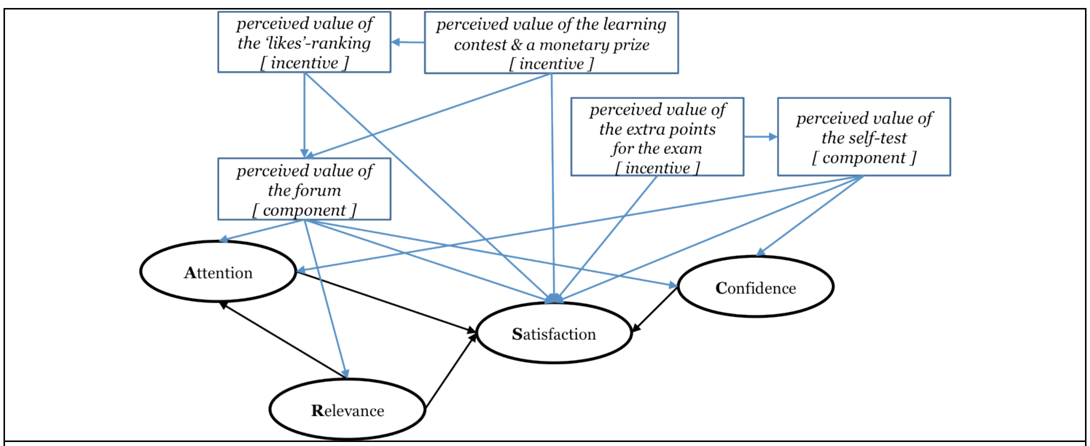

Figure 2. Modified ARCS Model with E-learning Components and Incentives

Theoretical Foundation on LMS Components and Incentives

To test our framework and hypotheses, we implemented a LMS in a large-scale course with more than 550 students at a major German university (we selected a basic course on marketing at Bachelor level because this course is one of the larger ones at this university). The course was attended by business administration and information systems students. The course took place between April and June 2012. The overall setting was designed as a blended learning approach since students were enabled to adopt components of LMS but also to attend to traditional face-to-face lectures twice a week. To support the learners and to find answers to our hypotheses, we customized the widely used open source LMS Moodle to our needs. The LMS generally included the following components: storage of lecture slides for downloading, self-test, and an online discussion forum that included functionalities to 'like' other students' contributions. Self-tests were introduced in the lecture, i.e., the lecturer presented a sample self-tests that provided an overview of the question types. All self-tests are based on the content presented in the respective lecture. They aim at preparing students for the final exam. Thus, the question type used is similar to that in the exam. Students were asked to answer multiple-choice tests, to complete cloze tests, and to solve arithmetic problems. Furthermore, these tasks' degree of difficulty was also similar to the tasks in the final exam. We therefore created self-tests that are highly related to the exam in order to ensure that these self-tests enabled learners to identify their weaknesses and strength relevant for successfully passing the exam. It took about 60 minutes to complete one self-test. In total, the students were asked to complete six self-tests. A self-test was provided at the end of every week. The students could only participate in the self-test and earn extra points within a week. A new self-test was set in the following week.

If there were mistakes in answering the self-test, students could discuss these in an online forum. At the start of the course, the forum did not contain any initial content. The lecturers did not actively participate in the forum discussions. Instead, other (senior) students moderated the forum. In order to ensure high-quality answers in the forum, all the moderators were extensively trained. Moreover, these moderators discussed the students' questions with their lecturer at least once a week. The forum itself was not anonymous, i.e., students were able to see each other's full names. The forum consisted of several sections, one for each lecture week. As Owston et al. (2013) show that low achievers might prefer traditional face-to-face tutorials, we also, on request, offered all learners face-to-face tutorials. However, at least in this course, no student requested a traditional face-to-face tutorial.

We conducted a survey after the final exam, i.e., our aim was to measure students' perceptions of the course after they had gained much experience with LMS components and after they were able to assess its benefits. We developed a questionnaire, which included questions on a 7-point rating scale. The survey consisted of two major parts. First, students' motivation (attention, relevance, confidence, and satisfaction) regarding the course was measured by applying the ARCS approach. Questions were based on the scales developed by Keller (1993) and published by Huang et al. (2006, also see Appendix A, Table 4). Second, we surveyed respondents' attitudes to the LMS's components (the online forum and the self-test, see Appendix A, Table 5; questions were based on Coyle and Thorson 2001 as well as Mathwick and Rigdon 2004), and their attitudes to the incentive types (the 'likes' ranking, the monetary prize, and the extra points, see Appendix A, Table 6; questions were based on Huff and Alden 1998).

Finally, we tested the influence of learning contests and the perceived value of financial incentives on students' evaluations of the online forum. The contest and financial incentives were announced at the start of the course. At the end of the course, the financial incentive (an iPad or its cash equivalent) was raffled among the 10 students with the highest 'likes' rankings.

Sample Description

In total, 156 respondents participated in the survey – a response rate of approximately 28%. Of these, 66 (42%) were female and 90 (58%) male. Our sample represents the structure of the course, in which male students dominate slightly. Most respondents are business administration students (78%), followed by information systems students (19%), and economics students as well as students from other fields (3%). The average student age is 22 years (with a standard deviation of 1.9 years). Most students are in their second (72%) or third year (accumulated 97%). We do not find significant differences between the final grades (in Germany, grades range from 1.0 [best result] to 5.0 [failed]) when comparing the mean average grade (2.25) with the respondents of the sample (mean = 2.15, one-sample t-test: T-value = -1.459, p-value = 0.149).

We tested nonresponse bias by comparing the indicator values in respect of early and late respondents (Armstrong and Overton 1977). The data set was divided into quartiles according to the number of days from the initial mailing until receipt of the completed questionnaire. Since none of our indicators showed significant ($p < .05$) differences between the early and late respondents, we concluded that nonresponse bias is not prevalent in our data.

Common method variance can bias findings if both independent and dependent measures are obtained from the same source, as in this study. To check for common method bias, we conducted Harman's single-factor test on our sample (Podsakoff et al. 2003). If common method bias is a serious problem, a single factor should emerge, or one general factor should account for most of the variance. A principal component factor analysis of all the measures yielded 10 factors with eigenvalues greater than 1.0. The largest factor accounted for less than 34% of the variance. This indicates that common method variance is unlikely to be a major concern in our research model.

Measurement Model Assessment

To check for reliability and validity of our reflective constructs, we tested for Cronbach's alpha as well as for composite reliability (ρ) and conducted a principal component analysis for each measurement model. Cronbach's alphas (α) ranging from .74 to .96, as well as the composite reliability ranging from .83 to .97 corroborate all of the reflective constructs' appropriateness. We also dropped indicators on the basis of their low loadings ($\lambda < .70$) resulting from structural equation modeling (see Appendix A). The remaining indicator loadings are highly significant ($p < .01$), ranging between .71 and .98. Principal component analysis confirms our one-dimensional construct's conceptualization. Finally, we assessed the discriminant validity on the basis of the criteria proposed by Fornell and Larcker (1981) as well as Chin (1998). Besides attention, the square roots of the average variance extracted (AVE) scores are all higher than the correlations among the constructs. Further, all indicators load higher on their respective constructs than on other constructs, providing additional support for discriminant validity (Chin 1998). Table 1 shows the standard deviations, means, and reliability of constructs, as well as the correlations between the constructs.

Table 1. Assessment of Measurement Models

Constructs	Mean	S.D.	α	ρ	1	2	3	4	5	6	7	8	9
1. Attention	5.28	.93	.88	.91	.59								
2. Relevance	5.08	.92	.83	.89	.81	.67							
3. Confidence	5.22	.88	.74	.83	.71	.59	.56						
4. Satisfaction	5.27	1.03	.87	.92	.89	.80	.71	.80					
5. Perceived value of the self-test	5.90	1.03	.92	.94	.52	.41	.53	.52	.77				
6. Extra points towards the exam	6.19	1.29	.96	.97	.44	.31	.37	.40	.61	.87			
7. Perceived value of the forum	5.18	1.17	.93	.95	.35	.36	.38	.36	.51	.33	.78		
8. Perceived value of 'likes' ranking	3.56	1.37	.95	.96	.26	*.15*	.40	.26	.30	.26	.45	.87	
9. Learning contest	4.47	1.61	.95	.96	.24	.18	.38	.25	.18	.17	.46	.69	.82

a. The off-diagonal elements indicate correlations, while the diagonal elements indicate the AVE.
b. Non-significant correlations ($p > .05$, two-tailed) are shown in italics.

Results and Discussion

We used partial least squares (PLS) structural equation modeling by means of SmartPLS 2.0 to test the hypothesized relationships illustrated in Figure 1 (Ringle et al. 2005). PLS can be a powerful analytical procedure because of its minimal demands regarding measurement scales, sample size, and complex structures; it is commonly used in many research fields, such as marketing and e-learning (e.g., see White et al. 2003; Wu et al. 2010; Yu et al. 2010). PLS estimation was chosen for three reasons: First, PLS considers all path coefficients simultaneously (thus allowing the analysis of direct and indirect relationships) and estimates multiple individual item loadings in the context of a theoretically specified model rather than in isolation (White et al. 2003). Second, PLS is preferred over maximum likelihood estimation approaches when the sample size is relatively small, as is the case in our study. Third, in comparison to covariance-based approaches, PLS can better handle complex structural models (Hair et al. 2011). Hence, we consider PLS an appropriate estimation technique for our purposes. To determine the parameter estimates' stability and significance, we used a bootstrapping routine (i.e., sampling with a replacement method). We calculated the t-values on the basis of 500 bootstrapping runs.

Structural Model Assessment

We report the beta coefficients and significances for the structural model, as indicated by the PLS analysis (Table 2). The overall model fits the data well, with an R2 of .82 for learners' overall satisfaction with the course. The model's predictive relevance was tested by means of the Stone-Geisser test (Q2). The Q2 value for learners' overall satisfaction with the course is positive (Q2 = .42) and indicates a sufficient predictive relevance level (Fornell and Bookstein 1982).

The detail of the ARCS model's results clearly indicate that the four ARCS dimensions are not independent from one another. In line with Keller (1999), we conclude that attention (β = .57, $p < .01$), relevance (β = .24, $p < .01$), and confidence (β = .13, $p < .01$) have significant positive relationships with learners' satisfaction with a course. We also transfer previous research on consumer behavior to an e-learning context by observing a significant positive influence of perceived relevance on learners' attention to the course (β = .72, $p < .01$). In our context, attention and relevance mainly influence learners' satisfaction – their influence is relatively high, whereas, learners' perceived confidence is less influential.

Results also indicate that perceptions of all components and evaluations of all incentive types significantly influence learners' motivation with the course (i.e., the four ARCS dimensions). We expected that a higher perceived value of the self-test will increase learners' confidence (H1a, β = .45, $p < .01$) and attention (H1b, β = .25, $p < .01$). We also expected a direct positive effect of students' perceived value of the self-test on their satisfaction. However, based on our analysis, our data do not support this hypothesis (H1c, β = .07, $p > .10$). Thus, based on our data, we confirm H1a and H1b, but reject H1c. We do not observe a direct effect of the perceived value of self-tests on learners' satisfaction (H1c), but indirect (i.e., mediating) effects (via the other ARCS dimensions). Furthermore, the perceived value of extra points reveal a significant positive effect on learners' perception of the self-test (H2a, β = .61, $p < .01$). Again, extra points do not directly influence learners' satisfaction (H2b, β = -.01, $p > .10$).

Furthermore, we expected that the perceived value of a forum will influence all ARCS elements. However, we do not find that a higher perceived value of a forum will significantly increase learners' attention (H3a, β = -.04, $p > .10$) nor their satisfaction with the blended learning environment (H3d, β = -.01, $p > .10$). However, we are able to confirm that a higher perceived value of a forum will significantly increase perceived relevance of the course content (H3b, β = .36, $p < .01$) and confidence (H3c, β = .15, $p < .05$). We also confirm that perceived value of students' 'likes' influences perception of the forum (H4a, β = .24, $p < .01$). However, there is no significant relationship between the perceived value of this incentive and learners' satisfaction (H4b, β = -.01, $p > .10$).

Finally, we expect a positive relationship between the perceived value of learning contests (monetary incentives) and perception of the 'likes' ranking, evaluation of the forum, and overall satisfaction. We confirm H5a (β = .69, $p < .01$) and H5b (β = .30, $p < .01$). As with the other components and incentives, we are not able to confirm a direct relationship between the perceived value of learning contests and overall satisfaction (β = .00, $p > .10$).

Table 2. Results of Hypotheses Tests

Investigated relationship	Expected direction	Standardized path coefficient	Overall finding
Attention → satisfaction	+	.57**	as expected
Relevance → attention	+	.72**	as expected
Relevance → satisfaction	+	.24**	as expected
Confidence → satisfaction	+	.13**	as expected
Perceived value of the self-test → confidence	+	.45**	H1a supported
Perceived value of the self-test → attention	+	.25**	H1b supported
Perceived value of the self-test → satisfaction	+	.07	H1c not supported
Extra points towards the exam → perceived value of the self-test	+	.61**	H2a supported
Extra points towards the exam → satisfaction	+	-.01	H2b not supported
Perceived value of the forum → attention	+	-.04	H3a not supported
Perceived value of the forum → relevance	+	.36**	H3b supported
Perceived value of the forum → confidence	+	.15*	H3c supported
Perceived value of the forum → satisfaction	+	-.01	H3d not supported
Perceived value of the 'likes' ranking → perceived value of the forum	+	.24**	H4a supported
Perceived value of the 'likes' ranking → satisfaction	+	.02	H4b not supported
Learning contest (monetary incentives) → perceived value of the 'likes' ranking	+	.69**	H5a supported
Learning contest (monetary incentives) → perceived value of the forum	+	.30**	H5b supported
Learning contest (monetary incentives) → satisfaction	+	.00	H5c not supported

a. Relationship significant at the .01 level = **, at the .05 level = * (one-tailed).

We do not observe significant direct relationships for any of our components and incentives on learners' satisfaction. However, perceived value of a component or incentive might influence overall satisfaction indirectly (e.g., by affecting other ARCS dimensions such as attention, relevance, or confidence). We therefore compute total effects for all components and incentives to account for possible indirect relationships. Results in indicate that the relationship between the perceived value of all components and overall satisfaction is mediated by the other ARCS dimensions. There is a significant indirect relationship between the perceived value of both e-learning components (self-tests and online forums) and overall satisfaction. We also identify similar significant indirect relationships for the two inventive types extra points and learning contests. However, though we identified a significant relationship between 'likes' and perceived value of forums, we were not able to identify a significant mediated relationship of 'likes' and overall satisfaction.

Table 3. Total Effects of E-learning Components and Incentives

Investigated relationship	Expected direction	Total effect
Perceived value of the forum → satisfaction	+	0.22**
Perceived value of the self-test → satisfaction	+	0.26**
Extra points towards the exam → satisfaction	+	0.15**
Perceived value of the 'likes' ranking → satisfaction	+	0.05
Learning contest (monetary incentives) → satisfaction	+	0.12*

a. Relationship is significant at the .01 level:**, at the .05 level:* (one-tailed).

With regard to the total effects, these values can also be interpreted as the importance weights of specific LMS components regarding learners' satisfaction. Thus, the perceived value of the self-test and that of the forum are the two major drivers of learners' satisfaction. Extra points and learning contests are of moderate importance, while the 'likes' ranking is less important than the other elements.

Implications

This study presents important implications for lecturers and future research. First, we show that the ARCS elements are not independent from one another. Although previous ARCS research (Keller 1999) suggests that attention, relevance, and confidence influence satisfaction, most research still treats these elements as independent and unrelated constructs, based on suggestions by Keller (1993, 2006). By providing more detailed insights, we thus seek to assist lecturers and researchers when conducting their own ARCS studies. Furthermore, we add to research by applying findings from consumer behavior research on the ARCS model and by showing that relevance influences learners' attention to a course.

Second, we assess how self-tests' and forums' perceived value influence learners' motivation. We show that the perceived value of self-tests and forums have a substantial influence on learners' motivation. Previous research (Yu et al. 2010) found that students care about their peers' feedback (e.g., in a forum). Our results indicate that the key to success of blended e-learning environments are students' value perceptions with respect to these components. Lecturers should ensure that students understand the value that self-tests and online forums provide. Clear communication of the e-learning components' benefits is likely to positively influence learners' attention (self-test), confidence (self-test and forum), and perceived relevance (forum). While we do not find a direct relationship between perceived value of e-learning components and overall satisfaction, we identified significant indirect relationships. Therefore, making sure that respondents understand the value of these components also positively influences learners' satisfaction with the blended learning environment. Lecturers should therefore influence learners' perceived value by communicating their potential benefits. Using incentives is also likely to influence learners' value perceptions of e-learning components. In addition, in line with Keller (2000), we argued that networking tools that provide learners with feedback are likely to increase learners' attention to the course. Contrary to our expectations, we do not find a significant positive relationship between the perceived value of the forum and learners' attention to the course, while we found a positive relationship between the perceived value of the self-test and learners' attention. Based on post hoc interviews with students, we assign different explanations to this unexpected finding. On the one hand, a review of our components shows that self-tests provide immediate feedback, whereas in online forums there might be a time lag between the inquiry and the possible feedback. Therefore, we assume that the relationship between the perceived value of the LMS components and learners' attention to the course is moderated by the time lag of providing feedback. On the other hand, our interviewees indicate that online forums are often perceived as unstructured, because they contain much repetition. Thus, we speculate that different ways of presenting information in the forum influences how forums can contribute to learners' attention to the course. For example, learners get immediate and clear feedback in a self-test, but will have to look for information on a forum. In sum, we expect that self-tests will hold learners' attention better, since these provide immediate feedback.

Third, we show that there is a relationship between the perceived value of all our incentives and the value attributed to the LMS components. Lecturers can therefore influence perceptions of these components by means of incentives. Our results also indicate that there is no direct relationship between perceived value of incentives and overall satisfaction with the course beyond what is explained by the relationships with the other ARCS dimensions. However, for perceived value of the two incentives extra points and learning contests, we find significant indirect relationships with satisfaction mediated by the LMS components and the three ARCS dimensions (attention, relevance, and confidence). We did not identify such a marginal effect for the incentive type 'likes' (similar to Facebook) on learners' satisfaction. Thus, students who value 'likes' higher do not necessarily reveal a higher satisfaction with the blended learning environment. Based on this observation, we assume that students might not value a higher social status in blended learning environments. One reason might be that our blended learning environment is a temporal social group and that the relationship strength between group members is fairly low. To conclude, the reputation based on peer-to-peer evaluations seems not to increase learners' satisfaction, whereas the perceived value of financial incentives reveals a positive marginal effect on learners' satisfaction. In sum, the perceived value of incentives may influence LMS components' value and at least some of them even influence overall learners' satisfaction.

Conclusions, Limitations, and Future Research

In this study, we investigated relationships between certain LMS components as well as different incentives on learners' motivation. By analyzing results of 156 completed surveys and by adopting the ARCS model, we showed that LMS components such as the perceived value of an online forum and self-tests influence students' motivation. Based on our data, we observed a significant indirect relationship between the perceived value of both LMS components (self-tests and online forums) and overall satisfaction. We also found significant indirect relationships for the incentives extra points and learning contests and satisfaction.

However, the following limitations of our study should also be considered in future research. First, we conclude that social elements such as peer review and reputation-building seem less influential compared to other studies. This might be a result of other studies' experimental setting, since they only consider social components while not considering other LMS components. However, it may also be a result of other factors such as course size, since we focus on a large-scale setting. We therefore suggest conducting replications in other course settings to confirm or disprove our findings. Additionally, there is a restriction in that, in this blended learning setting, we were not able to consider interactions by students other than their communication on the LMS. Further studies might also be needed regarding cultural influences or LMS usage in other disciplines, since this study strictly focused on German students of business administration and information systems. In this study, we focus on a 'classical' course structure, i.e., a top-down model that starts with a face-to-face lecture complemented by an online-tutorial based on a LMS. Future research should assess learning contexts in which the lecture is not the initial starting point, but the students' discussions and workshops are. Furthermore, about one-third of all the learners participated in the survey. We believe that this is a reasonable response rate. However, as not all the students participated, there might be a self-selection bias that influences our study's results. We do not find significant differences between the respondents and all of the course students concerning their learning success (measured based on their exam grades) and the structure (age, gender, major courses, etc.). Moreover, we tested for early and late responses and do not find differences. Nevertheless, the respondents might differ from the population regarding other, non-observed variables (such as cognitive styles). Future research could address this potential problem by integrating additional measures. Finally, as with any empirical study, our research results should be replicated in other courses, types of higher education (e.g., learning simulations and educational games, Beckem and Watkins 2012), and in other countries in order to ensure their generalizability.

Despite these limitations, our study represents an important contribution to the literature on LMS components' influence on learners' motivation. Benefits of our analysis are manifold. We make a theoretical contribution by arguing that ARCS dimensions are not uncorrelated. This is in line with previous research. For example, based on Keller (1999), we suggest that attention, relevance, and confidence influence the overall satisfaction with the course. Moreover, consumer behavior research also suggests that relevance influences attention (Solomon et al. 2010). We were able to confirm these relationships in an LMS context. Future research should explore these relationships in more detail. Furthermore, we showed that leaner satisfaction and motivation are influenced by usage of certain LMS components and by providing extrinsic incentives. Lecturers can also profit from our findings by being able to design proper blended learning settings through understanding how online learning instruments as well as incentives are related to learner perceptions.

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Appendix

Appendix A: Operationalization

Table 4. Operationalization of the ARCS Model

Order	ARCS dimension	Question
1	Confidence	When I first looked at this course, I had the impression that it would be easy for me. *
2	Attention	There was something interesting at the beginning of this course that got my attention.
3	Confidence (reversed)	This material was more difficult to understand than I would like for it to be. *
4	Confidence	After reading the introductory information, I felt confident that I knew what I was supposed to learn from this course. *
5	Satisfaction	Completing the exercises in this course gave me a satisfying feeling of accomplishment. *
6	Relevance	It is clear to me how the content of this material is related to things I already know. *
7	Confidence (reversed)	Many of the pages had so much information that it was hard to pick out and remember the important points.
8	Attention	These materials are eye-catching.
9	Relevance	There were stories, pictures, or examples that showed me how this material could be important to some people.
10	Relevance	Completing this course successfully was important to me. *
11	Attention	The quality of the writing helped to hold my attention.
12	Attention (reversed)	This course is so abstract that it was hard to keep my attention on it. *
13	Confidence	As I worked on this course, I was confident that I could learn the content.
14	Satisfaction	I enjoyed this course so much that I would like to know more about this topic.
15	Attention (reversed)	The pages of this course look dry and unappealing.
16	Relevance	The content of this material is relevant to my interests.
17	Attention	The way the information is arranged on the pages helped keep my attention.
18	Relevance	There are explanations or examples of how people use the knowledge in this course. *
19	Confidence (reversed)	The exercises in this course were too difficult. *
20	Attention	This course has things that stimulated my curiosity.
21	Satisfaction	I really enjoyed studying this course.
22	Attention	The amount of repetition in this course caused me to get bored sometimes. *
23	Relevance	The content and style of writing in this course convey the impression that its content is worth knowing.
24	Attention	I learned some things that were surprising or unexpected. *
25	Confidence	After working on this course for a while, I was confident that I would be able to pass a test on it.
26	Relevance (reversed)	This course was not relevant to my needs because I already knew most of it. *
27	Satisfaction	The wording of feedback after the exercises, or of other comments in this course, helped me feel rewarded for my effort. *
28	Attention	The variety of reading passages, exercises, illustrations, etc., helped keep my attention on the course.
29	Attention (reversed)	The style of writing is boring. *
30	Relevance	I could relate the content of this course to things I have seen, done, or thought about in my own life. *
31	Attention (reversed)	There are so many words on each page that it is irritating. *
32	Satisfaction	It felt good to successfully complete this course. *
33	Relevance	The content of this course will be useful to me.
34	Confidence (reversed)	I could not really understand quite a bit of the material in this course. *
35	Confidence	The good organization of the content helped me be confident that I would learn this material.
36	Satisfaction	It was a pleasure to work on such a well-designed course.

a. Indicators were dropped on the basis of their low loadings ($\lambda < .70$): *.

Table 5. Questions Used to Evaluate the E-learning System's Components	
Based on the following items, how do you evaluate [...]?	
1	Bad / Good
2	Unfavorable / Favorable
3	Dislike / Like
4	Negative / Positive
5	Low quality / High quality

Table 6. Questions Used to Evaluate the Incentives	
Based on the following items, how do you evaluate [...]?	
1	Not favorable / Favorable
2	Bad / Good
3	Negative / Positive
4	Worthless / Valuable*
5	An incentive to participate in the e-learning system [original: buy] / a disincentive to participate in the e-learning system [original: buy]

a. Indicator was dropped on the basis of its low loading ($\lambda < .70$) in the measurement of perceived value of the 'like' ranking = *.