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**How Individual Interest Influences Situational Interest and How Both are  
Related to Knowledge Acquisition: A Micro-Analytical Investigation**

Jerome I. Rotgans\*

Lee Kong Chian School of Medicine

Henk G. Schmidt

Erasmus University Rotterdam, The Netherlands

\*Lee Kong Chian School of Medicine, Nanyang Technological University  
11 Mandalay Road, 308232 Singapore. Phone: +65 91725213, e-mail:  
[rotgans@gmail.com](mailto:rotgans@gmail.com)

### Abstract

The extent to which a student experiences situational interest during a learning task is dependent on at least two factors: (1) external stimuli in the learning environment that arouse interest and (2) internal dispositions, such as individual interest. The objective of the present study was to disentangle how both factors influence situational interest during task engagement. Two datasets were collected from primary school science ( $N = 186$ ) and secondary school history students ( $N = 71$ ). Path analysis was used to examine the influence of individual interest on seven situational interest measurements and knowledge acquisition. The results suggest that individual interest has only a significant influence on situational interest at the beginning of a task and then its influence fades. In addition, individual interest is not a significant predictor of learning. Only situational interest predicts knowledge acquisition. Implications of these findings for interest research are discussed.

*Keywords:* Active learning; Individual Interest; Situational Interest; Problem-based learning; Instructional problems

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To actively engage with and persist on a learning task, students need to be sufficiently motivated. The motivational state students experience during engagement with a particular task is often referred to as *situational interest* (Schraw, Bruning, & Svoboda, 1995; Schraw, Flowerday, & Lehman, 2001). Unlike its grown-up brother *individual interest*, which represents a dispositional type of interest more or less stable over time, situational interest is considered to be a temporary state that can be aroused by teacher-induced stimuli, such as problems, texts, videos, or assignments (Ainley, Hidi, & Berndorff, 2002; Hidi, 2006). That interest can manifest itself as a *state* (situational interest) and a *trait* (individual interest), makes it a rather distinctive motivational concept different from other motivational constructs, such as self-efficacy, task value, or goal orientation (Murphy & Alexander, 2000;)(Hidi, 2006). Most of the attention in this field has typically been directed towards addressing questions such as how situational interest can be aroused and how it develops into the more stable individual interest (Hidi & Renninger, 2006). More recently, however, researchers have begun to suggest that individual interest may also have a significant influence on situational interest when students engage with a learning task (e.g., Tapola, Veermans, & Niemivirta, 2013).

To elucidate this point, consider the following scenario. Students arrive at a science class, and after they have settled in, receive an intriguing problem. They are supposed to work on it in small collaborative teams. The problem itself is likely to arouse students' situational interest in the topic at hand, but there are arguably also dispositional factors that may influence how situationally interested each student is. For example, students who like and value science and who perhaps even have an

ambition to pursue a career in science (i.e., who have well-established individual interest in science) would arguably tend to be more interested in the specific topic at hand than students who have less affinity with the discipline. Students with a more stable interest in science feel more interested from the start and therefore may be more situationally interested throughout the lesson. The point we wish to make here is that situational factors alone may not fully account for the degree of experienced situational interest when engaged with a task at hand.

Thus, we hypothesize here that situational interest is influenced both by instructional stimuli and pre-existing individual interest for the subject in general. The extent to which (1) each of these two factors influences situational interest during task engagement, and (2) how they interact with learning, is however not yet well understood. Assume that individual interest dominates both situational interest and subsequent learning. Then, attempts to influence situational interest through didactic interventions would be bound to be futile. On the other hand, if instructional interventions govern the emergence of situational interest, largely independent of any preexisting individual interest for the subject, then education could make a difference, in particular if such situational interest would drive learning. The objective of the present investigation, therefore, was to explore the extent to which instructional problems and pre-existing individual interest differentially influence situational interest during engagement with a learning task and how they predict knowledge acquisition. That is, the knowledge students had acquired at the end of a learning session.

### **Situational Interest**

The role of didactic stimuli in the arousal of situational interest has been extensively studied (Ainley, Hidi, et al., 2002; Schiefele, 1999; Schraw, 1997; Schraw

et al., 1995; Schraw & Lehman, 2001). Early attempts predominantly examined how features of instructional texts influence situational interest (Hidi & Baird, 1988; Schraw, 1997). Providing texts that contain surprising, incongruent, and unexpected information seems to have a positive effect on situational interest (e.g., Iran-Nejad, 1987). More recent studies focus on task conditions that are conducive to situational interest to emerge. Tapola et al. (2013), for instance, demonstrated that the extent to which a task is concrete (rather than abstract) positively influences situational interest. Høgheim and Reber (2015) conducted a study to examine the extent to which “example choice” (having a choice which text to study) and “context personalization” (in which features of a text are customized to the learners’ out-of-school interests) affect situational interest. Both example choice and context personalization had a positive effect on arousing students’ situational interest. In addition, much research has been devoted to determine whether seductive details (information that is interesting but irrelevant to understanding a text) have a positive effect on situational interest and text comprehension. Although the findings of earlier studies were inconclusive (some suggesting that seductive details have a positive effect (Schraw, 1998) whereas others suggesting they have no positive effect on situational interest and learning (Garner, Gillingham, & White, 1989)), recent studies revealed that seductive details have a positive effect on students’ situational interest and learning only if cognitive load is kept low (Park, Flowerday, & Brünken, 2015; Park, Moreno, Seufert, & Brünken, 2011).

The present authors have tackled the cognitive mechanism underlying the arousal of situational interest (Authors, 2011, 2014). They have demonstrated that situational interest is only aroused when students lack knowledge of the topic at hand. Only when students become aware that there is a gap between what they know about

a topic and what needs to be known, situational interest is aroused. In their view, therefore, aroused situational interest signifies a need for knowledge. However, if the need for knowledge is satisfied, for instance through instruction or self-study, situational interest must consequently decrease. They conducted their studies in the context of problem-based learning, an instructional approach that showed positive effects of problems on interest already in the early eighties (Schmidt, 1983).

### **Individual Interest and its Influence on Situational Interest**

Studies investigating how individual interest influences situational interest during learning only recently emerged in the literature. Ainley, Hillman, and Hidi (2002) measured both individual and situational interest in literary texts among secondary school students. Their results suggest that text titles provided to the students prior to reading the actual text body aroused situational interest, whereas individual interest made a relatively small contribution to arousing interest. Tsai, Kunter, Lüdtke, Trautwein, and Ryan (2008) examined the relations between individual and situational interest in three secondary school subjects. Individual interest was measured at the beginning of the study and situational interest measures were administered at the end of each lesson over a period of three weeks. Situational interest data were then aggregated and correlated with the individual interest measure. The results suggest that individual interest for the subject was significantly associated with situational interest measured at the end of class (correlations ranging from .42 to .52). The authors maintain that individual interest in fact has a significant effect on subsequent situational interest, a finding contradicting the results of the Ainley et al. (2002) study. However, Ainley, Hillman, et al. (2002) examined how individual interest influences situational interest at the *beginning* of the task, whereas Tsai et al. (2008) examined the influence of individual interest and situational interest at the *end*

of the lesson. If one wishes to reconcile these findings one has to assume that, for some reason or another, individual interest has a larger effect on situational interest at the end of the task as compared to the beginning. For instance, as a result of a better understanding of the particular topic at the end of a learning cycle, situational and individual interest become more “similar.” However, Harackiewicz, Durik, Barron, Linnenbrink-Garcia, and Tauer (2008) conducted a study with college students who were enrolled in an introductory psychology course. At the beginning of the course both individual interest and situational interest measures were administered. Situational interest was measured once again towards the end of the semester. They found that individual interest was not only significantly correlated with situational interest at the beginning of the course ( $r = .32$ ) but also towards the end ( $r = .28$ ). In short, the findings currently available to understand the relation between individual and situational interest are inconclusive.

### **Interest and Knowledge**

The relation between interest and knowledge acquisition is similarly confusing. Some studies suggest that situational interest is positively associated with learning outcomes. Rotgans and Schmidt (2011a), for instance, conducted a path analysis to examine how situational interest developed over a one-day problem-based learning session and how it predicted knowledge acquisition. The results of this study suggest that situational interest was a significant predictor of learning, explaining about 20% of the variance in knowledge acquisition. In the Tapola et al. (2013) study mentioned above, the findings were however less straightforward. Tapola et al. included a measure of individual interest, which enabled them to examine the potentially differential influence of situational interest and individual interest on knowledge acquisition. None of the correlations found were statistically significant.

The latter findings are at variance with a meta-analysis conducted by Schiefele, Krapp, and Winteler (1992). Summarizing 121 studies carried out between 1965 and 1992, they found a mean correlation coefficient between individual interest and academic achievement of .31 (note that they did not summarize findings with regard to situational interest). Considering the inconclusive findings, more research is required in this area as well.

### **The Present Study**

To advance the field further in understanding how individual interest influences situational interest during task engagement and how both play a role in learning, a number of suggestions derived from the studies summarized above may be helpful. First, studies involving the arousal of situational interest should include a clearly identifiable precipitating event that is supposed to influence situational interest. Most of the studies reviewed above (with the exception of Ainley, et al., 2002) make no mention of a specific arousing experience that may have induced situational interest. Simply measuring situational interest at the beginning or the end of a learning episode may not be sufficient to understand how individual interest, situational interest, and learning are related. Second, if situational interest is indeed a fleeting, temporary, phenomenon, multiple measurements at critical points *during* the learning process may be called for rather than confining oneself to pre- and post-measures only. Finally, exploring how interest predicts knowledge acquisition is crucial, if one believes that interest has a role to play in the learning process.

To address these limitations, we conducted a study in which a measure of individual interest was administered at the beginning of a two-hour learning exercise in an authentic classroom setting. After the first situational interest measure, a problem was introduced, consisting of a description of some real-life phenomena in

need of explanation (see Appendix for the problems used in this study). We have demonstrated in previous studies that problems are strong arousers of situational interest because they induce the awareness of a knowledge gap in students (Authors, 2011, 2011, 2014). Directly after the problem presentation, the second situational interest measure was taken, followed by another six measurements of situational interest taken at critical junctures in the learning process. At the end, a measure of knowledge acquisition was administered. Relations between the variables involved were analyzed using structural equation modeling.

### **Hypotheses Tested**

We hypothesized that individual interest would only influence students' situational interest at the very beginning of the intervention—that is when students are informed about the general topic that they are about to study and before the problem is introduced. At this point in time students are predominantly dependent on their pre-existing individual interest to estimate how situationally interested they are in the topic. We further expected that this initial level of situational interest would influence each following measure of situational interest. Moreover, as soon as the problem is presented and hence the general topic concretizes itself in an easy to recognize problem, we hypothesized that this powerful instructional cue would largely override the direct effect of individual interest because students (independent of their predispositions about the subject) would want to find out more about the problem. Indicative of the accuracy of this prediction would be the observation of a significant *decrease* in associations between the individual interest measure and subsequent situational interest measures *after* the problem is introduced. Furthermore, we hypothesized that situational interest would be a stronger predictor of students' knowledge acquisition than pre-existing individual interest because increased

situational interest caused by the problem at hand determines (to a larger extent) what students actually are prepared to learn.

In summary, we predicted that (1) before instruction starts, situational interest is highly correlated with individual interest (because individual interest is the only source that students have available to base their level of their situational interest on). (2) After the confrontation with the problem, the influence of individual interest on situational interest wanes, because situational sources of information (the problem presented, the texts to be studied) become more important. And (3) knowledge attainment is determined to a larger extent by situational interest than by pre-existing individual interest.

To test the generalizability of our findings we collected two datasets, one from primary school science and one from secondary school history. We thus attempted to replicate the findings in two different contexts and with two different age groups.

## **Method**

### **Participants**

Students from two state schools in Singapore participated in this study. State schools form the majority of schools and are most representative of Singapore's education system. Singapore's education system is based on the British School System with primary and secondary education. Primary education starts from the age of seven and is a four-year foundation program (Primary 1 to 4) and a two-year orientation stage (Primary 5 to 6). Primary education is compulsory. At the end of Primary schools, students sit for a Primary School Leaving Examination and their results determine in which stream they enter secondary education. There are four streams: special, express, normal (academic), normal (technical). Special and express are four-year courses leading to the Singapore-Cambridge GCE "O" level exam. The

Normal streams are also four-year courses leading to the Normal-level exam. Students in the normal (academic) stream have the possibility to do an additional fifth year if they perform well, which gives them the opportunity to sit for the Singapore-Cambridge GCE “O” level exam. The normal (technical) students take subjects that are more technical in nature, such as design and technology, and will typically proceed to vocational training institutions (Institutes of Technical Education). The medium of instruction is English in all schools.

For the studies, we selected two samples from two different subject domains and from different school levels: a primary-school science sample (Study 1) and a secondary-school history sample (Study 2). The students from the secondary school were students from the express stream. The sample size for the primary school science group was  $N = 186$  (43% female) with an average age of 10 years ( $SD = 0$ , Primary 5) and consisted of five intact classes. The sample size for the secondary school history class was  $N = 71$  (48% female) with an average age of 14 years ( $SD = .28$ , Secondary 2) and consisted of two intact classes. For each school, one teacher conducted the lesson respectively. The teachers were briefed beforehand, which entailed running through the lesson with the help of a protocol. See Appendix for the protocol the two teachers followed to conduct the classes.

## **Materials**

***Individual Interest Measure (II)***. Individual interest was measured by means of the *Individual Interest Questionnaire* (Rotgans, 2015), which has been validated for different subject domains and with students in different age groups ranging from primary education to high school. The Individual Interest Questionnaire (IIQ) consists of seven items (sample items: “*Outside of school I read a lot about science*” and “*I always look forward to my science lessons because I enjoy them a lot*”). All items

were scored on a 5-point Likert scale, ranging from 1 (*not true at all*) to 5 (*very true for me*). Hancock's coefficient  $H$  was calculated as a reliability measure. The coefficient  $H$  is considered a more accurate measure of reliability than the much-used Cronbach's alpha (Hancock & Mueller, 2001; Sijtsma, 2009). Its recommended cut-off value is .70. The coefficient  $H$  for primary school science was .86 and for secondary school history  $H = .75$ , which suggest adequate reliability of the measure.

***Situational interest measure (S)***. Rotgans and Schmidt's situational interest questionnaire was used in this study (Rotgans & Schmidt, 2011a, 2011b). The instrument consists of six items (sample items: "*I think this topic is interesting*" and "*I want to know more about this topic*") that load on a single latent factor. All items were scored on a 5-point Likert scale: 1 (*not true at all*), 2 (*not true for me*), 3 (*neutral*), 4 (*true for me*), and 5 (*very true for me*). It took the participants less than 60 seconds to respond to the questionnaire. The coefficient  $H$  for primary school science was .94 and for secondary school history  $H = .87$ , which suggest high reliability of the measure.

***Knowledge acquisition (CRT)***. Participants' knowledge acquisition was measured by means of a *Concept Recall Test* (Yew, Chng, & Schmidt, 2010). The Concept Recall Test requires each participant to write down all the concepts and ideas she or he can recall about a given topic. A further instruction is that only keywords or bullet points are admissible and not full sentences. The Concept Recall Test is a test that can be used to measure the growth of students' knowledge over time, focusing on the number of relevant concepts students attain during learning (Rotgans & Schmidt, 2014b). It is based on the idea that students, while learning, develop over time richer and more tightly integrated semantic networks of concepts of a domain (Collins & Quillian, 1969; Glaser & Bassok, 1989). The better integrated and the more

comprehensive these semantic networks are, the more concepts will students recall. The Concept Recall Test is scored by means of a list containing all admissible concepts (the “answer key”), which was devised by subject experts beforehand. The list was based on the key concepts or ideas extracted from the learning resources students had to read. The answer key was then used to score each student’s Concept Recall Test. For each accurate concept, participants were awarded one point, which was done by an experienced rater. However, to examine inter-rater agreement, an additional independent rater scored 25% of the responses (Intraclass Correlation Coefficient  $ICC = .98$  for primary school science and  $ICC = .92$  for secondary school history).

### **Procedure**

The procedure was identical for both studies. Data were collected over the duration of three sessions. The duration of the first session was 30 minutes, the duration of the second session 60 minutes, and the third session lasted for 30 minutes. Before the first session commenced, participants were asked to respond to the Individual Interest Questionnaire. Subsequently, the topic to be studied was announced. For Study 1 it was “properties of light” and for Study 2 “the fall of Singapore during World War II” (see Appendix for both problems and the protocol). Immediately after this announcement, the first situational interest measure was administered. After this, the problem was presented. After students had read the problem, the second situational interest measure was administered. Students were then given a form that they had to fill in to systematically write down (1) what they know about the problem, (2) what they do not know about the problem, and (3) what they want to find out about the problem (i.e., the learning goals). This took about 15 minutes and was followed by the administration of the third situational interest

measure, which concluded the first session. The second session began with administering the fourth situational interest measure. Students then had approximately 45 minutes to engage in individual self-study to search for answers to their learning goals. Each student received the same learning materials, which were prepared by a research assistant and a subject-matter expert. At the end of the second session the fifth situational interest measure was administered. The third session began with the administration of the sixth situational interest measure. The teacher then asked the students to share their findings with the class. Only at this point, the teacher facilitated the discussion by asking questions that challenged students' understanding of the problem. The questions were standardized and provided to the teachers beforehand (see Appendix for details). Once all questions were addressed, the seventh situational interest questionnaire was administered, followed by the administration of the concept recall test, which concluded the third and final session. The sessions constituted a conventional problem-based learning sequence of events (Hmelo-Silver, 2004; Schmidt, 1994; Schmidt et al., 2011). See Figure 1 and 2 for a visual overview.

### **Analysis**

In both studies, we applied a *micro-analytical measurement approach* (Rotgans & Schmidt, 2011a), which involves repeated administration of short self-report measures of situational interest *during* the learning event. This methodology provides the researcher with a close to real-time picture of what is going on during the intervention (Ainley, Hidi, et al., 2002). We assumed that the micro-analytical measurement methodology would provide us with a more detailed operational window of what happens during a task and enable us to examine the dynamic interplay of both types of interest and students' knowledge acquisition. The repeated measures obtained through the micro-analytical measurement approach can best be

analyzed by means of path modeling under the structural equation modeling paradigm because it enables testing of all relations the same time (Byrne, 2012). This enabled us to examine how individual interest is related to each measure of situational interest and how both are related to the knowledge measures.

All analyses were conducted using Mplus 7.3 (Muthén & Muthén, 1998-2012). There were two types of missing data: (1) missing data for individual items (e.g., failed to respond to one or more items) and (2) missing data due to absence of students at one or more lessons (e.g., illness). The first type of missing data constituted less than 1% for all measurements—both for the primary and secondary sample—and therefore did not constitute a problem (Graham, Cumsille, & Elek-Fisk, 2003). The magnitude of the second type of missing data was as follows. For primary school science: session 1 = 6%, session 2 = 12%, and session 3 = 4%. For secondary school history session 1 = 1%, session 2 = 8%, and session 3 = 7%. To deal with this type of missing data we used the robust maximum likelihood (MLR) and mean-adjusted  $\chi^2$  statistics in Mplus (Byrne, 2012). As students were nested within their classes we applied the “complex” option in Mplus.

The relations between individual interest (II), situational interest (S), and knowledge acquisition (CRT) were examined by means of path analysis using structural equation modeling. Two path models were tested, one for each study in primary school science and in secondary school history. To examine the goodness-of-fit for both models, we generated the Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), and Comparative Fit Index (CFI) along with the  $\chi^2$  statistic. Cutoff values of .06 (RMSEA), .09 (SRMR) and .95 (CFI) were used in the analysis (Hu & Bentler, 1999).

## Results

For an overview of the zero-order correlations and descriptive statistics see Table 1.

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Insert Table 1a/b about here  
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The results of the first path analysis for the primary school science sample suggest that the data fitted the model well:  $\chi^2(20) = 30.60, p = .06$ ; CFI = .99; RMSEA = .06 (90% CI: .00-.09); SRMR = .05. Inspection of the path model revealed that individual interest had the strongest association with the first measure of situational interest ( $\beta = .66, p < .001$ ), just at the beginning of the first session (see Figure 1 for an overview). The remaining path coefficients between individual interest and situational interest measurements were non-significant, with the exception of the fourth situational interest measure (II-S4). Moreover, the results of the path analysis revealed that *only* situational interest—and not individual interest—was a significant predictor of knowledge acquisition ( $\beta = .20, p < .01$  vs.  $\beta = -.07, p = .29$ ). Also interesting to note is that each situational interest measurement was highly related with the following measure.

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Insert Figure 1 about here  
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The results of Study 2, involving the secondary school history sample, replicated the findings of the first study. The data fitted the model reasonably well:  $\chi^2(18) = 33.01, p = .02$ ; CFI = .96; RMSEA = .11 (90% CI: .05-.17); SRMR = .10 and the path coefficient closely resembled the pattern observed in primary school (see Figure 2 for an overview). As with the findings of the previous study, individual

interest was most strongly associated with the first measurement of situational interest at the beginning of the first session ( $\beta = .46, p < .001$ ). The path coefficients then rapidly decreased in magnitude and did not show any significant associations, except for the third measurement of situational interest (II-S3). Also in line with the findings involving the primary school science sample, only situational interest was a significant predictor of knowledge acquisition and *not* individual interest ( $\beta = .29, p < .001$  vs.  $\beta = .02, p = .11$ ). Finally, each situational interest measurement was also highly related to each adjacent measurement of situational interest.

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Insert Figure 2 about here  
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### Discussion

The objective of the present study was to disentangle how instructional stimuli and individual interest differentially influence situational interest and knowledge acquisition during an authentic learning task. To that end we introduced a didactic problem in both a science and a history class. The science problem concerned properties of light, while the history problem problematized the fall of Singapore during World War II. The purpose of introducing these problems was to arouse situational interest in the topic. Prior to its introduction students' individual interest in respectively science or history was measured and a first situational interest measure was taken. After the problem was presented, and students engaged in various learning activities, situational interest was measured another six times at critical junctures in the learning process. Finally, a measure of knowledge acquired was taken. This "micro-analytical" measurement design allowed us to study—close to real time—how individual and situational interest interact over time and how they affect

learning. Repeating the study in another context, with a different subject and at a different age level, allowed us to test the generalizability of our findings.

While planning the two studies we hypothesized that individual interest would only influence students' situational interest at the very beginning of the intervention, before the problem is introduced (hypothesis 1). At this stage, pre-existing individual interest determines the extent to which students experience situational interest in the topic at hand. With hypothesis 2 we anticipated that this initial level of situational interest would influence each following measure of situational interest. However, as soon as the problem is presented, we hypothesized that it would largely override the direct effect of individual interest (hypothesis 3). Finally, we expected that situational interest would be a stronger predictor of students' knowledge acquisition than pre-existing individual interest (hypothesis 4).

The results of both studies generally supported these hypotheses. They allow for five conclusions: First, the influence of individual interest on situational interest indeed turned out to be limited. Only the first measure of situational interest, taken before the problem was introduced, was highly correlated with individual interest. This seems to suggest that individual interest only determines situational interest in the absence of a situationally arousing event. This may perhaps explain why Harackiewicz et al. (2008) found significant relations between both variables: If no specific instructional event triggers situational interest, then measured situational interest is just a special manifestation of the existing dispositional preferences of students.

Second, any influence of individual interest on situational interest disappears as soon as the problem takes over (with one exception later to be discussed). It seems that situational interest emerges in response to the problem and is independent of

preexisting dispositional interest; even students who are not really interested in science or history may become situationally interested when challenged by a problem. This is in line with previous findings. Rotgans and Schmidt (2016) found that post-problem situational interest scores were significantly and constantly higher than individual interest scores, suggesting that even those who display lackluster interest in a particular subject may be aroused when a thought-provoking problem comes by. The findings may also explain why Ainley, Hillman, et al. (2002) failed to find any influence of individual interest on situational interest. Like our study, they employed a precipitating event arousing situational interest, breaking the bond between individual and situational interest.

Third, the extent to which a student was situationally interested early in the session did influence levels of subsequent situational interest, as indicated by the high path coefficients between the successive situational interest measurements. Somewhat surprisingly this also holds true for the relation between the pre- and the post-problem measurement. It seems that, although pre-problem situational interest is partly determined by individual interest—as suggested above—it also contains the germs out of which later situational interest is born. The high path coefficients however do not imply that levels situational interest are maintained throughout the learning process. On the contrary, we have found repeatedly that situational interest decreases over time (Authors, 2014), most probably because it is satisfied by the new knowledge acquired. The high path coefficients simply indicate that initial differences in situational interest among students remain stable over time.

Fourth, situational interest in both studies significantly influenced knowledge acquisition, attesting to the central role of this construct in learning. Students who were more aroused by the problem performed better on the Concept Recall Test than

those who were less aroused. Other studies suggest that this effect emerges because more highly aroused students experience the gap between what is known and what needs to be known to a higher extent and therefore engage more extensively with the materials to be studied (Loewenstein, 1994; Schmidt et al., 2011).

And fifth, individual interest does not directly influence subsequent knowledge acquisition. In both studies, we found non-significant direct paths between these variables. Its influence on learning is indirect though, mediated by situational interest. Also, the raw correlation coefficients between individual interest and knowledge were non-significant. The latter finding is clearly at variance with the meta-analysis conducted by Schiefele et al. in 1992. They found an average correlation of .31 between interest and achievement. It is unlikely that they summarized findings mainly involving situational interest. A distinct possibility is that individual interest is not so much a cause of learning but rather a *byproduct*: Students performing well will experience as a result of this an increased level of individual interest. There is some evidence that this is indeed the case. Bloom (1976) found that interest was not an input variable of learning but an outcome. In a cross-lagged panel analysis involving knowledge acquired and individual interest measured at two points in time we found that knowledge influenced individual interest rather than the other way around (Authors, In Press).

There are two anomalies in our data. It appears that individual interest had some influence on situational interest measure 4 in Study 1 and on measure 6 in Study 2 (see Figure 1 and 2). At this point it is not entirely clear why this occurred. Had we only the data of Study 1 at our disposal we would have hypothesized that since there is a one-day break between situational interest measurements 3 and 4, existing individual interest again briefly dominates to some extent situational interest (notice

also the lower path between situational interest measurement 3 and 4). It looks like individual interest is temporarily taking over again. However, this anomaly is not replicated in Study 2, leaving us with some unexplained data.

### **Implications of Findings**

What are the implications of these findings? First, the results confirmed the hypothesis that when students engage with a learning task for a particular school subject they always bring with them a certain degree of individual interest for that subject, which determines their starting level of situational interest. The premise that students are initially “blank slates” in terms of their individual interest, and that situational interest comes first and then develops into individual interest, as current interest models suggest, seems to be off the mark. A prominent example is the Hidi and Renninger (2006) theoretical model of interest development, in which it is assumed that interest develops over four phases. During the first two phases only situational interest is present: triggered situational interest and maintained situational interest. Subsequently, a transition then takes place from situational interest to emerging individual interest and eventually to well-developed individual interest. It seems that a reformulation of this model should take into account the fact that a certain amount of individual interest is always present for any school subject and does not develop from scratch.

Second, our findings may have implications for instructional practice because they suggest that even if students do not have a deep-seated interest in a school subject, such as science or history, the lack of individual interest can be offset by means of instructional intervention (e.g., through the introduction of problems or puzzles) that arouse students’ situational interest in the learning task at hand. In short: lack of individual interest can be counteracted by challenging instructional problems.

Among educators the idea often prevails that interest is a dispositional quality of a student. That is, a student is either interested in a subject or is not interested in the subject (Pintrich, 2004). This trend of emphasizing students' dispositional attitudes as a critical factor for schooling seems to be on the rise. For instance, in The Netherlands, universities presently select students based on their initial interest in a particular subject. In medical schools worldwide, interest measures such as a "motivation letter" play a role in the selection of medical students (Murden, Galloway, Reid, & Colwill, 1978).

Although it is true that students have varying degrees of individual interest for different school subjects, which largely determines their starting level of situational interest, the findings of our two studies demonstrate that introducing problems can make up for the lack of initial individual interest—bearing in mind that only situational interest determined task performance and not individual interest. This finding is particularly relevant for formal schooling (primary and secondary school) because there, unlike in university or vocational training, students cannot always select school subjects that are aligned with their individual interests. The discovery that lack of individual interest can be compensated for by instructional interventions to arouse students' situational interest, seems particularly relevant for educational practice and calls for the use of active-learning strategies that make use of problems to arouse students' interest (Schmidt et al., 2011).

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Table 1a: Correlations and Descriptive Statistics for Individual Interest (II), Situational Interest Measurements (S), and Concept Recall Test (CRT) for Study 1 Primary School Science.

Variable	II	S1	S2	S3	S4	S5	S6	S7	CRT
II	-								
S1	.67**	-							
S2	.60**	.89*	-						
S3	.50**	.72**	.82**	-					
S4	.61**	.79**	.80**	.75**	-				
S5	.48**	.65**	.64**	.66**	.83**	-			
S6	.44**	.62**	.64**	.67**	.75**	.83**	-		
S7	.45**	.67**	.68**	.69**	.79**	.84**	.91**	-	
CRT	.02	.06	.09	.06	.01	.11	.16*	.21**	-
Mean	3.43	3.95	4.00	3.96	3.96	3.95	3.91	3.92	7.24
(SD)	(.84)	(.85)	(.81)	(.89)	(.82)	(.82)	(.86)	(.84)	(1.96)

Note: \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$

Table 1b: Correlations and Descriptive Statistics for Individual Interest (II), Situational Interest Measurements (S), and Concept Recall Test (CRT) for Study 2 Secondary School History

Variable	II	S1	S2	S3	S4	S5	S6	S7	CRT
II	-								
S1	.47**	-							
S2	.35**	.68**	-						
S3	.47**	.74**	.80**	-					
S4	.28*	.63**	.75**	.77**	-				
S5	.26*	.41**	.61**	.74**	.67**	-			
S6	.34**	.53**	.66**	.73**	.76**	.76**	-		
S7	.31*	.49**	.62**	.71**	.64**	.80**	.85**	-	
CRT	.11	.15	.20	.13	.18	.19	.30*	.31*	-
Mean	2.87	3.50	3.62	3.64	3.35	3.38	3.40	3.57	8.47
(SD)	(.58)	(.52)	(.63)	(.70)	(.62)	(.62)	(.69)	(.71)	(3.16)

Note: \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$

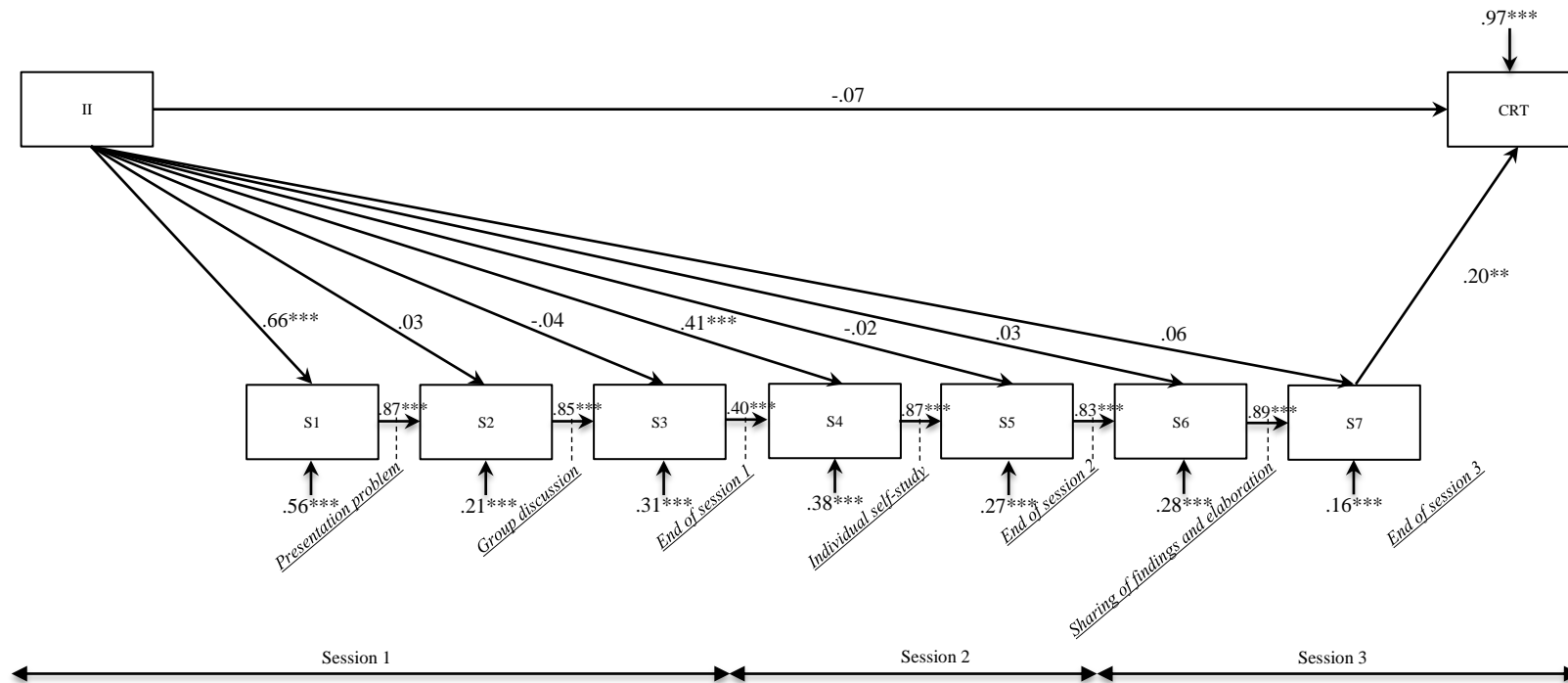


Figure 1. Study 1: Path Model for Primary School Science Depicting the Relations Between Individual Interest (II), Situational Interest Measurements (S), and Concept Recall Test (CRT).

Note: all values are standardized regression weights; \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$

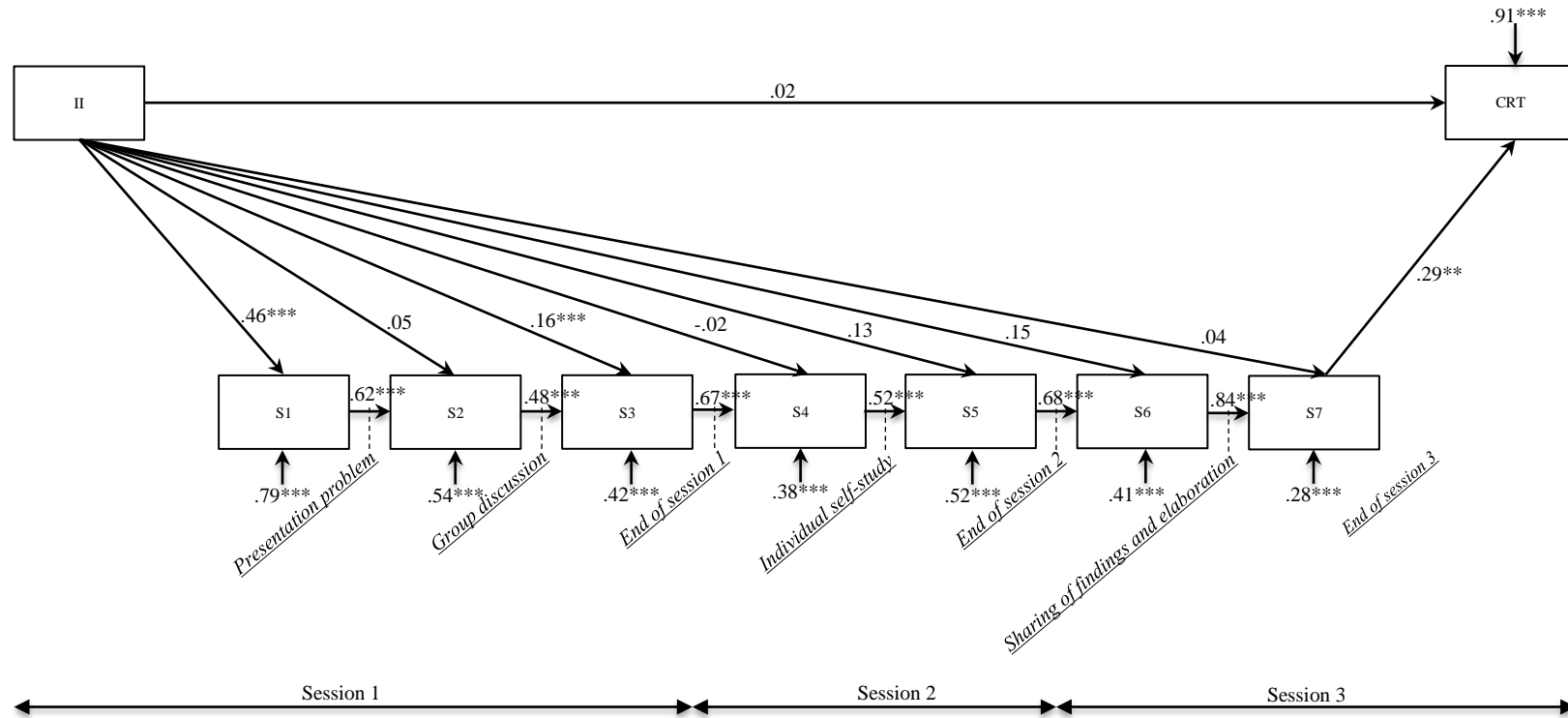


Figure 2. Study 2: Path Model for Secondary School History Depicting the Relations Between Individual Interest (II), Situational Interest Measurements (S), and Concept Recall Test (CRT).

Note: all values are standardized regression weights; \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .00$

