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Interest, A Motivational Variable That Combines Affective And Cognitive Functioning

S. Hidi

K. Ann Renninger
Swarthmore College, krennin1@swarthmore.edu

A. Krapp

4

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Suzanne Hidi
Ontario Institute for Studies in Education of the University of Toronto

K. Ann Renninger
Swarthmore College

Andreas Krapp
University of the Federal Armed Forces—Munich

Theories and empirical research about the interrelation of motivation, emotion and cognition have a long tradition in education and educational–psychology (e.g., Claparède, 1905; Dewey, 1913; James, 1890; Leontjew, 1977). In comparison to most research approaches and theoretical traditions in other fields of psychology, educational-psychological approaches to these concepts have been related more closely to practice in a wide variety of educational settings in and out of schools. For example, topics of research in the areas of motivation and cognition have been concerned with learning and achievement, and the language used has tended to be familiar to educators and teachers.

Educational psychologists integrated new concepts and methods from other fields of psychology into their research as a way to more fully address issues of practice. Thus, when psychometric approaches relying on quantitative measures became dominant in the area of intelligence research, many investigators in the field of educational psychology began to conceptualize and measure variables using psychometric approaches. Statistical tools were adopted to measure talent (giftedness), as well as cognitive factors based on traditional intelligence tests. As a consequence, research efforts focused on interindividual differences. This line of research however, did not address

intraindividual development, nor information about the relations between the variables under consideration (Krapp, 1999; Medved, Hidi, & Ainley, 2002; Murphy & Alexander, 2000).

When in the 1970s, mainstream psychology began to shift from a behavioral to a cognitive paradigm, a similar shift occurred in educational psychology, particularly in the field of motivation research. In fact, most theories of learning motivation have been based on a cognitive framework focusing on learners' thoughts and beliefs (Meyer & Turner, 2002). For example, achievement goal theory (Ames, 1992; Dweck & Leggett, 1988; Dweck, Mangels, & Good, chap. 2) focuses on how students' goals are related to academic performance. According to this theory, individual achievement goals provide a framework to establish learning purposes and a general approach to academic activities and achievement tasks. In addition, achievement goals have also been presumed to influence affective reactions to engagements. Task value theory, another basically cognitively driven approach (Eccles et al., 1983; Wigfield & Eccles, 1992, 2002) describes motivation as resulting from students' expectations of task value. Such expectations reflect students' beliefs as to how desirable a given activity is. Incentive value, utility value, intrinsic value and cost are components of the total value students establish cognitively for future activities. Yet another motivational theory based on a cognitive framework is self-efficacy theory (Bandura, 1977, 1982, 1997; Zimmerman, 1989, 2000). Self-efficacy theory postulates that individuals' beliefs about their ability to produce successful outcomes and attain designated goals are critical to their achievement motivation. Students' goals, task value and self-efficacy have been found to positively affect students' effort, the quality of their academic performance and their willingness to participate in challenging academic tasks (Ames, 1992; Bandura, 1997; Bandura & Schunk, 1981; Heckhausen, 1991; Pajares, 1996; Pintrich & De Groot, 1990; Wigfield & Eccles, 2002; Zimmerman, 2000).

As a consequence of the shift to a cognitive paradigm in motivational research, emotions and affective variables were pushed into the background and studied in only a few areas (Hidi & Baird, 1986; Pekrun, 2000). Eventually, it was recognized that emotional and motivational processes of learning also needed to be explored. In particular, researchers considered it necessary to examine the conditions of intraindividual differences and development. They noted that cognitive theories do not tend to take into account motivational factors that have an influence on a subconscious level and that are related to situation-specific emotional experiences (Hidi, 1990; Krapp, 2002b, 2003). For instance, goal theories have been concerned with general issues of goal-fulfillment, such as mastering a topic or task or achieving certain learning goals, etc. Yet for education, questions arise as to why individuals are interested in one area or topic but not in another.

In fact, from both a psychological and an educational point of view, it is essential to explain why and how students can become interested in new content and subject areas (H. Schiefele, 1978). Results from investigations of this type, furthermore, can provide a basis for understanding the functional relations between motivation, learning and achievement (Heckhausen, 1991; Krapp, 2003). Such explanations can address how school curriculum could best provide opportunities for interest development and increased motivation of students. Thus, for example, Hoffmann (2002) described the implications of interest for curriculum development and classroom composition; Renninger and Wozniak (1985) pointed to the power of interest as a facilitator of student attention and memory; and Sansone, Weir, Harpster, and Morgan (1992) suggested that older students can be supported to regulate their attention and at least a maintained situational interest for boring tasks.

EDUCATIONAL PSYCHOLOGY RESEARCH RELATED TO INTEREST, MOTIVATION, AFFECT, AND COGNITION

Interest Research: A Historical Review

Traditionally, the concept of interest held a central position in educators' thinking about learning. Educational laypersons (e.g., parents), as well as professional educators (e.g., teachers, trainers) often refer to interest when they consider the motivational prerequisites for teaching and learning, or think about students' more or less successful developmental processes. In fact, most educators agree that an important goal of education is the differentiation and stabilization of interests relevant to learning (Dewey, 1913; H. Schiefele, 1978, 1981). In view of the significance attributed to interest within the educational context, it would not be surprising that interest-related research be an important field of educational psychology. Accordingly, at the turn of the 20th century, prominent psychologists advocated that interests were the most important motivational factors in learning and development (e.g., Arnold, 1906; Claparède, 1905; Dewey, 1913; James, 1890; Thorndike, 1935).

Subsequently, however, the interest concept was pushed into the background as first behaviorism and later the shift towards cognitive approaches in psychology spawned numerous other motivational concepts related to learning and development (cf. Ames & Ames, 1984; Heckhausen, 1991; Weiner, 1972). Research on motivation and learning that began to emerge focused on seemingly immediate problems that could be easily studied empiri-

cally (e.g., the explanation and prediction of academic achievement). During this period, only diagnostic approaches to vocational interests continued to use interest as a psychological construct (e.g., Fryer, 1931; Strong, 1943; Walsh & Osipow, 1986). In this line of research, interest was conceptualized as a kind of motivational trait, rooted in a stable person and environment relationship (e.g., a person was considered to be social or artistic, see Holland, 1973).

In the last two decades of the 20th century, interest research reemerged in educational psychology due to recognition that aspects of learning motivation central to discussions of interest could not be adequately reconstructed given the theoretical concepts most popular in modern cognitively oriented motivation research. For example, in the area of text-based learning it was demonstrated that the type and the extent of learning from text depended on psychological factors that were related to the content or the topic of the text, as well as cognitive and motivational variables (Hidi, 1990). Thus, one area in which the rejuvenation of interest research took place was in investigations of text-based learning (e.g., Anderson, 1982; Asher, 1980; Hidi & Baird, 1986, 1988; Hidi, Baird, & Hildyard, 1982; Kintsch, 1980; Schank, 1979). Subsequently, a relatively large number of empirical studies concerned with the influence of interest on learning and with the development of interests were conducted (cf. Hidi & Anderson, 1992; Krapp, 1989; Prenzel, 1988; Renninger & Lecrone, 1991; Renninger & Wozniak, 1985). This work primarily built on research traditions in psychology and educational psychology (see Hoffmann, Krapp, Renninger, & Baumert, 1998; Lehrke, Hoffmann, & Gardner, 1985; Renninger, Hidi, & Krapp, 1992).

Recent interest research has focused on studying the relationships between interest, learning and achievement at different levels of education (Baumert & Köller, 1998; Krapp, Hidi, & Renninger, 1992; Prenzel, 1988; Renninger, Ewan, & Lasher, 2002; Renninger & Hidi, 2002; Sansone et. al., 1992; Schiefele, 1999, 2001; Schiefele, Krapp, & Winteler, 1992). Findings from this work suggest that an interest-based motivation to learn positively influences both how learners realize and organize a given learning task (e.g., the kind of learning strategies used) and the quantity and quality of learning outcomes.

Developmental studies have also been undertaken in order to address the development of interests. These investigations tended to be undertaken with younger students in pre-schools and in elementary schools (Fink, 1991; Fölling-Albers & Hartinger, 1998; Krapp & Fink, 1992; Renninger, 1989, 1990; Renninger & Leckrone, 1991). Such studies have focused on interest held over time, changes in interests, and the relation between cognitive and affective processing during engagement. Unfortunately, empirical studies using cross-sectional as well as longitudinal studies suggest a decline in student interest for school subjects as students' level of schooling increases (e.g.,

Gardner, 1998). In fact, decline in school subject interests have been found as early as the first year of elementary school when classrooms constrain children's abilities to explore new contents and engage interests (Fölling-Albers & Hartinger, 1998; Helmke, 1993), and have also been widely reported for secondary school students. Declines in interest for these students have been most evident in the fields of physics, chemistry, and mathematics, and it appears to be more pronounced for girls than for boys in these subjects (Gardner, 1985; Hoffmann et al., 1998). It also appears likely that such declines are partially due to a lack of environmental support for engaging student interest rather than a developmental shift in the capacity to have interest, suggesting that school culture could make a significant contribution to the likelihood that interest for particular content continues to develop and can be sustained (Eccles, Wigfield, & Schiefele, 1998; Hoffmann, 2002; Renninger, Ewen, & Lasher, 2002; Renninger & Hidi, 2002; Renninger, Sansone, & Smith, 2004; Schraw & Dennison, 1994).

Another question that has received considerable attention concerns how individuals' patterns of interests change over time. For example, with the beginning of puberty dramatic changes in individuals' personal interests can be observed (Gardner, 1985, 1998; Krapp, 2000). In part, these shifts are the result of the general tendency of adolescents to adapt the contents and pattern of their interest to gender role stereotypes (Hannover, 1998; Todt, 1985). Among studies that attempt to explore gender-related developmental processes over a longer period of the life span are those of Gisbert (1998, 2001) who showed that the development of an individual interest in academic subjects is highly influenced by adolescent developmental processes, especially by the quality of occupational and university enrollment decisions. Young people, who carefully explore their future aspirations and commit themselves to their decisions, show long term interests in their chosen subject, even in the case of a gender atypical major (e.g., women in mathematics). In the long run, interests become important components of a person's identity (Hannover, 1998; Hidi & Ainley, 2002).

Several research programs have analyzed in detail the relations between cognitive and affective processing during interest-based learning activities (e.g., Harackiewicz & Durik, 2003; Renninger & Hidi, 2002). Empirical studies in the field of physics education have examined the continuous relations between students' situation-specific individual experiences, cognitive processes and the occurrence and stabilization of content-specific interests (Fischer & Horstendahl, 1997; Krapp & Lewalter, 2001; Lewalter, Krapp, Schreyer, & Wild, 1998; von Aufschnaiter, Schoster, & von Aufschnaiter, 1999). Results from these studies demonstrated a marked influence of the continuous experiential feedback during tasks on subsequent motivation for learning.

The Construct of Interest

The term interest has been used in a variety of different ways. In everyday usage, interest almost always refers to positive feelings and is equally likely to refer to an attraction, a preference, or a passion (Valsiner, 1992). Among educational researchers, interest has had almost as many different meanings. For example, links between interest and more trait-like conceptualizations such as general curiosity (Ainley, 1987, 1993) or love of learning (Renninger et al., 2004) can be made. Interest has been studied as a habitual preference (or attitude), a motivational belief, and as a characteristic of the developing self (or personality) (Krapp, Renninger, & Hoffmann, 1998).

In the present chapter, we focus on interest-based motivation, that is, a motivational state that results either from a situational interest or an individual interest. Briefly, situational interest is conceptualized as being generated by particular aspects of the environment that focus attention, and it represents an affective reaction that may or may not last (see Hidi, 2001, for a review). Whereas, individual interest is conceptualized as being both a relatively enduring predisposition to attend to objects and events and to reengage in certain activities over time (Krapp, 1993, 2000; Renninger & Wozniak, 1985; see Renninger, 2000, for a review) and a motivational state. In this conceptualization, a motivational state during engagement can be fueled by processes, dispositions, or both that are related to some type of interest, thus interests can be examined and reconstructed theoretically at two levels of analyses. First, interest research can focus on the psychological processes and states that occur during concrete interactions between a person and his or her object of interest. In this case the analysis focuses on the description and explanation of interest-triggered actions. Second, interest research can focus on interest as a relatively enduring disposition. In summary, interest is both a motivational process or state and a relatively enduring disposition to reengage with particular content.

Hidi and Renninger (2003) noted that the dual meaning of interest as a psychological state and as a predisposition to reengage with objects, events and ideas over time has frequently not been acknowledged in the literature. Hidi and Renninger (2003) further suggested that there is a developmental thread that links the repeated experiences of interested engagements to produce the psychological state of interest and its development as a disposition (Hidi & Anderson, 1992; Krapp, 2002b; Renninger, 2000; Silvia, 2001).

Independent of whether interest is examined at the level of the ongoing processes and resulting states or at the level of the dispositional structures of the individual, three features of the interest construct distinguish it from other motivational variables. First, a general characteristic of interest is its content or object specificity. As Hidi and Renninger (2003) pointed out, interest refers to focused attention, engagement, or both with the affordances

of particular content and it is this content that can be said to suggest possibilities for activity. As such, the content of interest does not share the type of universality that characterizes other motivational variables.

Second, the conceptualization of interest exists in a particular relation between a person and content, and does not simply reside either in the person or in the content of interest. In accordance with the ideas of Hidi and Baird (1986), Lewin (1936), Nuttin (1984), H. Schiefele (1978), and many others, it is postulated that the individual, as a potential source of action, and the environment as the object of action, constitute a bipolar unit. This relation has been recognized to be central to both situational interest (Hidi, 1990) and individual interest (Renninger, 1990; Renninger & Wozniak, 1985), and among researchers in the German research community, it has been referred to as person-object theory (Krapp, 2002a, 2003). The relation is dynamic rather than static and has particular relevance to educational practice because educators can have an influence on environmental aspects (see discussions in Hidi & Anderson, 1992; Mitchell, 1993; Renninger, 2000; Schraw & Dennison, 1994). Thus, according to this theoretical approach, interest-related learning and development is conceptualized to be the result of an interaction between a person and his or her social and physical environment.

Third, interest has both cognitive and affective components (Hidi, 1990; Renninger, 1992). As Hidi and Renninger (2003) pointed out, the relative amount of cognitive evaluation and affect generated may vary depending on the particular phase of interest development. Thus, a triggered situational interest may involve only minimal cognitive evaluation and positive affect; whereas, a well-developed individual interest for particular content would include both stored knowledge and stored value, as well as positive affect.

The close relation between cognitive and affective components of interest-informed activity have been described as accounting for why no contradiction is experienced between the cognitive-rational assessment of personally experienced importance and positive emotional evaluations of an activity itself (Dewey, 1913; Krapp, 2000, 2002a; Rathunde, 1993; Schiefele, 1999). The affect associated with interested engagement tends to be positive. Possible exceptions are triggered situational interest which may be negative (Bergin, 1999; Hidi, 2001; Hidi & Anderson, 1992; Hidi & Harackiewicz, 2000; Hidi & Renninger, 2003; Iran-Nejad, 1987) and experiences of temporary frustration by persons who have well-developed interest for particular content (Krapp & Fink, 1992; Prenzel, 1992; Renninger, 2000; Renninger & Leckrone, 1991).

It is positive emotion that is likely to fuel the development of interest and learning behaviors that have been characterized as focused, generative, and deep. In fact, as Dewey (1913) postulated, when conditions to support interest are in place, effort will follow (see discussion in Renninger, 2003). This is

one of the reasons why an interest-based action (e.g., knowledge acquisition of content that is an identified interest) seems to have the quality of intrinsic motivation (Deci, 1998).

In their recent paper, Meyer and Turner (2002) noted that psychologists have tended to study the processes of cognition, motivation, and emotion separately. They further note that current cognitive theories of motivation focus on cognition and motivation, and emotions have not been central features of influential motivational theories such as goal theory, expectancy-value theory and self-efficacy theory. In these theories, affect has been considered as an outcome variable (Hidi, 2003a, 2003b; Meyer & Turner, 2002), and it has been assumed that desirable thoughts and beliefs such as mastery goals, high task-value and increased levels of self-efficacy produce positive affect and/or reduce negative affect. However, as Meyer's and Turner's (2002) students' surveys indicate, emotions are central to an understanding of students' goals, strategies and self-efficacy. Emotions are not necessarily outcomes of cognitive processes.

The assumption that affect is an inherent component of interest is a critical feature of the interest construct and sets interest apart from other motivational constructs (Hidi, 2003a, 2003b; Hidi & Renninger, 2003). Experiencing interest involves affect from the outset of experience and can be assumed to be combined or integrated with cognition (Krapp, 2003; Renninger, 2000). An important aspect of this view is that it allows the integration of psychological and neuroscientific approaches with motivation which has not previously been an easy association (Boekaerts, in press; Kuhl, 2000). Future work needs to address the distinctive neural correlates of interest-based information processing that involves both emotional and cognitive systems.

Neuroscientists studying affect have started to identify the neural circuits involved in emotional processing. Some researchers have proposed two basic systems of approach and avoidance (see Davidson, 2000, for a detailed neurophysiological discussion of these systems). The approach system has been associated with appetitive behavior and with generating certain types of approach-related positive affect. Parts of this system appear to be involved in the expression and movement toward abstract goals in action plans and in the anticipation of rewards. Although the association between interest and the approach system, to the best of our knowledge, has not yet been fully explored, recent research has established the neural basis of negative emotions such as fear and its relation to learning and motivation (LeDoux, 2000). Hidi (2003b) and Hidi and Renninger (2003) have suggested that the "seeking system"—one of the evolutionary and genetically ingrained emotional brain systems specified by Panksepp (1998, 2003)—is one of the major biological foundations of the psychological state of interest. Research examining further this relation may lead to the integration of psychological and neuroscientific components of interest.

Situational and Individual Interest From a Developmental Perspective

Although the authors of this chapter have previously described two or three phases of interest development (e.g., Hidi & Anderson, 1992; Krapp, 2002b; Krapp et al., 1992), Hidi and Renninger (2003) recently proposed a Four-Phase Model of Interest Development. According to this model, in the first phase, situational interest for a particular subject content is triggered. If this triggered situational interest is sustained, the second phase, referred to as maintained situational interest, evolves. The shift from maintained situational interest to an emerging individual interest is fueled by a person's curiosity questions about the content of interest (Renninger, 2000). These questions are accompanied by efforts to self-regulate and identify with the content of interest (Hannover, 1998; Krapp, 2000, 2003; Todt & Shreiber, 1998). With increased ability to self-regulate and identify with particular content, a student moves into the final phase of development that is referred to as well-developed individual interest.

In the following section of this chapter, research related to each of the four phases of interest is overviewed. Research on triggered and maintained situational interest is presented first, followed by research on emerging (or less-developed) and well-developed individual interest.

Research Related to Phases of Situational Interest

Because by definition, situational interest is triggered by environmental factors, objects, individuals, or both, research has focused on identifying the conditions that contribute to the triggering of this type of interest. In two early studies, Schank (1979) and Kintsch (1980) distinguished between interest that is related to feelings (emotional interest) and interest that they saw as an outcome of cognitive processing. Although researchers at that time did not acknowledge the distinction between situational and individual interest, in retrospect we can conclude that both Schank and Kintsch were describing situational interest. Recently, Harp and Mayer (1997) revisited the notion that emotional and cognitive sources of situational interest may result in different types of processing and set out to demonstrate empirically this assumption. In their study, they compared the effect of coherent text that according to their theory would elicit cognitive interest, with the effects of seductive text segments and illustrations, presumed to elicit emotional interest. The results indicated that texts aimed at increasing emotional interest failed to improve understanding of scientific explanations, whereas coherent texts contributed to increased comprehension and increased learning. The authors maintained that these results indicate a qualitative difference in the two types of interest and that, in the

case of cognitive interest, processing of coherent texts promoted a sense of positive affect about the passage that led to increased learning.

Whereas it is possible to set up research paradigms that separate emotional and cognitive interests, we believe that such separations may be artificial, as emotional and cognitive functioning appear to continuously interact in interest development. In addition, we have no neurophysiological indications of unique neural processes underlying exclusively emotional and cognitive processes, and it is more likely that both systems are involved to varying degrees.

Focusing more specifically on discourse, several research groups worked on identifying text characteristics that contribute to triggering readers'/listeners' situational interest. In early studies of text features, novelty, unexpected surprising information, intensity, concreteness and visual imagery were found to contribute to situational interest (Anderson, Shirey, Wilson, & Fielding, 1987; Hidi & Baird, 1986, 1988). Following this work, Schraw, Brunning, and Svoboda (1995) identified six sources of text-based (situational) interest: (a) ease of comprehension (Mitchell, 1993; Wade, Buxton, & Kelly, 1999); (b) prior knowledge (Alexander, 1997; Alexander, Jetton, & Kulikowich, 1995); (c) text cohesion (Kintsch, 1980; Wade, 1992); (d) vividness (Sadoski, Goetz, & Fritz, 1993); (e) reader engagement (Mitchell, 1993); and (f) evocative emotional reactions (Krapp et al., 1992). The experimental findings of Schraw et al. (1995) further indicated that only some of these sources of interest were related significantly to subjects' actual feeling of interest (referred to as perceived interest by the authors). Furthermore, a lack of interactions between the six sources of interest suggested that a number of individual factors rather than complex interactive relationships between factors were responsible for the elicited situational interest. Finally, the finding that prior knowledge ratings were only marginally related to perceived interest, and they were unrelated to recall, suggested that knowledge alone is not a sufficient factor to increase text-based (situational) interest and learning.

In an investigation that also focused on sources of interest, Wade et al. (1999) studied the characteristics associated with self-reported interest of informational (science) texts. Their findings overlap with those of Schraw et al. (1995) in some areas such as comprehension and imagery. Other text characteristics that Wade et al. (1999) found to be associated with higher interest were novelty and importance/value.

Social aspects of the environment have also been found to influence the development of situational interest. For example, Isaac, Sansone, and Smith (1999) reported that working with others increased some individuals' situational interest. Häussler and Hoffmann (1998) found that girls' situational interest was mediated by the gender of those who were present in the learning situation. More specifically, girls' interest in physic lessons was supported by mono-educational classes. Hidi, Weiss, Berndorff, and Nolan's (1998) research that focused on learning in a science museum setting, indicated that

the social structuring of the learning experience through a cooperative learning technique called a jigsaw (Aronson, Blaney, Stephen, Sikes, & Snapp, 1978; Slavin, 1991) can contribute to the elicitation of situational interest (Hidi & Harackiewicz, 2000). Similarly, provision of scaffolds in the organization of classroom instruction can provide students with opportunities to make connections to learning, and to maintain situational interest (Renninger & Hidi, 2002; Renninger, Sansone, & Smith, 2003). In addition, an individual's ability to self-regulate activity can increase his or her situational interest. For example, Sansone and Smith (2000) and Wolters (1998) demonstrated in separate studies that individuals can devise and use interest-enhancing strategies to overcome boredom.

In many of the previously mentioned studies, the distinction between the two phases of situational interest (triggered and maintained) have not been acknowledged. However, this distinction has special educational relevance, since research indicates that environmental factors that trigger situational interest may be different from those that help maintain it (Hidi & Baird, 1986). Mitchell (1993) empirically demonstrated that whereas group work, puzzles and computers sparked adolescents' interest in math, only meaningfulness of tasks and personal involvement held and sustained (maintained) students' interest over time. Harackiewicz, Barron, Tauer, Carter, and Elliot (2000) extended these findings by showing that factors that maintained college students' interest were better predictors of their continuing interest in psychology than factors that only triggered their interest. These findings suggest that the outcomes associated with triggered situational interest only involve short-term changes in affective and cognitive processing, such as sudden changes in affect and increased automatically allocated attention, whereas maintained situational interest is more likely to have relatively longer term affective and cognitive outcomes. For example, early studies demonstrated that interest narrows the range of inferences people need to consider, and facilitates the integration of information with prior knowledge (Schank, 1979). Hidi and Berndorff (1998) and Schraw and Lehman (2001) summarized the most frequently found learning outcomes associated with situational interest.

Attention as a Mediator Between Interest and Learning

In general, the literature indicates that the psychological state of interest is a positive influence on learning, and that the relation between interest and learning is mediated by attention (e.g., Berlyne, 1960; Dewey, 1913; Hidi, 1995; James, 1890; Renninger, 1990; and Thorndike, 1935). Early on, Roe and Siegelman (1964) defined interest as any activity (action, thought, observation) to which one gives effortless and automatic attention. Subsequent research also supported the mediating role of attention between interest and

learning (e.g., Izard, 1977; Larson, 1988; Renninger & Wozniak, 1985). Miller and colleagues (Miller & Weiss, 1982; Miller & Zalenski, 1982) demonstrated that even children in kindergarten are aware that interest influences their attention and subsequent learning.

The relation between interest and attention is complex however, and its importance has been the subject of recent discussion. Like those who first contemplated the relation of interest, attention, and learning, Hidi and colleagues (Hidi, 1990, 1995, 2001; Hidi & Anderson, 1992; Hidi & Berndorff, 1998) maintained that attention is a critical mediating variable. Anderson and colleagues (Anderson, 1982; Anderson, Mason & Shirey, 1984; Shirey & Reynolds, 1988; etc.) and Schiefele (1998), however, claimed that attention is an epiphenomenon that occurs simultaneously with learning, but is not causally related to increased learning of interesting information. Their conclusions were based on the results of a number of studies in which it was assumed that interesting information is processed the same way as important information. That is, they assumed that as readers process text segments, they rate them for interest and importance and then consciously allocate attention to selected text segments. Importantly, attention in these investigations was measured through reading and secondary task reaction times and the following predictions were made: (a) interest would result in escalated learning; (b) interest would result in increased attention which could be measured by slower reading and secondary task reaction times; and (c) the increased time spent on the tasks could be shown to be causally related to learning.

Anderson and colleagues found that whereas the first prediction pertaining to interest resulting in increased learning was substantiated, the other predictions were not. Adult readers, contrary to expectations, read interesting information faster than less interesting information. Children, as predicted, read interesting information slower than other information, however a complex statistical analysis suggested that the relationship between attention and learning was not causal. Based on these findings, the researchers had concluded that attention was not on the causal path between interest and learning.

In response to the Anderson (1982), Anderson et al. (1984) studies, Hidi (1995, 2001) argued that some of the results may have been inappropriately interpreted. They questioned the prediction that increased attention due to interest would necessarily result in slower reading and secondary task reaction times. Such predictions have been based on the paradigm that has been used to explain the processing and superior recall of important information. However, different cognitive and affective functioning may be involved in processing interesting versus important information. More specifically, to determine importance, readers have to evaluate information relative either to previously processed information or to some self-generated standard, and they have to keep continuously updating their evaluations. These operations may significantly add to the cognitive load of the readers and the time they

spend on the task of reading important sentences. However, to recognize that a sentence is interesting does not require the same kind of cognitive evaluation and decision making process. With the help of affective reactions, readers may recognize interesting information instantaneously, without having to compare it to previously presented information, and therefore more efficient processing that results in faster reading and secondary task reaction times could be predicted.

Recently, McDaniel, Waddill, Finstad, and Bourg (2000) examined whether interest fosters greater selective allocation of attention that results in slower text processing (Anderson, 1982), or does interest result in automatic allocation of attention, freeing up cognitive resources in the process, and allowing for more rapid processing of information (Hidi, 1990, 1995). McDaniel et al. (2000) developed stories that differed globally in how much interest they generated, rather than adopting the more common procedure of varying the interest value of individual sentences (e.g., Wade, Schraw, Buxton, & Hayes, 1993). Secondary task reaction times were used to evaluate the time needed for processing the texts. Since the beginning of stories tend to have similar levels of interest and only as stories develop, could one expect differences in the interest levels that they generate, the authors presented secondary task probes at various points in the stories. This procedure allowed them to obtain and compare reaction times during the first and second halves of the stories. The results showed that, whereas the reaction times for the early portion of the texts did not differ across high and low interest stories, reaction time for the second half of the narratives showed significant differences. More specifically, readers of less interesting narratives took significantly longer time responding to the probes placed in the second half of the texts than those reading more interesting texts.

In addition, for low interest stories, subjects' reaction times were significantly lower during their reading of the later parts than the earlier parts of the text. No such differences were found for the more interesting stories. The authors concluded that the readers allocated more selective attention to the later half of the low interest stories than to the first half, while they maintained a fairly consistent level of selective attention allocation in the case of high-interest stories. McDaniel et al. (2000) concluded that their findings supported Hidi's hypothesis that interest generates spontaneous (automatic) attention resulting in more efficient and faster processing of information.

In none of the previously reviewed investigations did researchers specify the type of interest that was studied. Considered in light of Hidi and Renninger's (2003) proposed Four-Phase Model of Interest Development, it appears that these studies focused on readers' psychological state in the triggered and maintained phases of situational interest, elicited by the stories that they were reading. In stories, readers do not have problems with organization and unimportant details, nor with the evaluation of what is important versus

what is interesting and they read faster what is more interesting. However, reading speed and secondary task reaction times may be less appropriate measures of the attentional processes involved in reading texts that are not stories. For example, in the case of expository texts, not only do readers have to process text, but they also have to deal with the evaluation of the importance of text segments and such evaluations may require allocation of selective attention that slows down the reading process. Reading times and secondary task reaction times also may not be appropriate or serve as the best way to measure attention related to individual interest.

Research Related to Phases of Individual Interest

While individual interest can refer to forms of only more skilled (expert) performance, especially among older students and adults (Alexander, 1997, this volume), here individual interest is used to describe the motivated engagement of people of all ages and all levels of skills, and it refers to a person's relatively enduring predisposition to reengage particular content(s) over time and his or her psychological state during this engagement. Research on individual interest addresses both the process and progress of student learning over time. A close relation between the changing structure of a person's longer lasting individual interest for content and the course of individual personality development begins at a very early age (Krapp, 1999). Children appear to develop relatively stable preferences for particular objects and these are related to their cognitive engagement (Kasten & Krapp, 1986). Furthermore, findings from studies of young children's free play indicate that girls and boys will explore operations such as balance or sequencing, and will use more strategies in their play with play objects of well-developed rather than less-developed individual interest (Fink, 1991; Krapp & Fink, 1992; Renninger, 1989, 1990, 1992, 1998; Renninger & Leckrone, 1991).

Individual interest has been found to support school-age students' abilities to work with difficult texts, mathematical word problems, and school projects (Renninger et al., 2002; Renninger & Hidi, 2002) and to enhance the contexts within which they learn (Fölling-Albers & Hartinger, 1998; Goldman et al., 1998; Hoffmann, 2002; Hoffmann & Häussler, 1998; Renninger & Hidi, 2002). Although the presence of an identified individual interest will not in itself teach students skills (Renninger, 1992), it does appear to provide a forum for learning skills when instruction, television or computer programming, museum education, etc. is adjusted to include such individual interests as problem solving contexts (Fay, 1998; Hoffmann & Häussler, 1998; Renninger et al., 2002).

Schiefele and Krapp (1996) reported that among university students, individual interest was positively related to comprehension of meaning, or propositional recall and negatively related to word, or verbatim, recall. Findings

from this study further confirm the impact of individual interest on cognitive functioning. Alexander and Murphy's (1998) and Alexander, Murphy, Woods, Duhon, and Parker's (1997) studies of differences in the learning profiles of college-age students also support the importance of individual interest to the generation of strategies for learning.

Studies of individual interest have considered the role of interest at different developmental stages, with respect to different school subjects, across varying educational settings including preschool and elementary school (Renninger, 1998), secondary school (Baumert & Köller, 1998), colleges and universities (Alexander et al., 1997; Alexander & Murphy, 1998; Krapp, 1997), and vocational education and training (Krapp & Wild, 1998; Prenzel, 1998; Wild, Krapp, Schreyer, & Lewalter, 1998). Briefly, findings from these studies suggest that individual interest has an effect on students' course selection (Bargel, Framheim-Peisert, & Sandberger, 1989; Drottz-Sjoeberg, 1989), as well as their choice of occupation (Gottfredson, 1981; Krapp, 2000). Furthermore, social relationships appear to influence both the maintenance and continuity of individual interest (Gisbert, 1998, 2001; Pressick-Kilborn & Walker, 2003; Renninger, 1989, 2000; Renninger & Hidi, 2002).

Studies of individual interest have also focused on mediating variables that may explain the positive effects of interest-based learning at the level of functional processes (Ainley, Hidi, & Berndorff, 2002; Schiefele & Rheinberg, 1997). Attention, as discussed previously, is one of the few variables that have been analyzed in detail. Others include learning strategies (Alexander et al., 1997; Alexander & Murphy, 1998; Wild, 2000) and emotional experiences (Krapp & Lewalter, 2001; Lewalter et al., 1998; Schiefele, 1996; Schiefele & Csikszentmihalyi, 1994). Importantly, study of the conditions and processes that lead people to learn and continue to work with content over time, consistently refer to the significant role of emotional experiences associated with genuine interest (Drottz-Sjoeberg, 1989) or "undivided interest" (Rathunde, 1993, 1998).

From a developmental point of view, the usefulness of acknowledging the existence of two phases of individual interest has been suggested (Renninger, 2000). These two phases of interest include: emerging (or less-well developed) individual interest and well-developed individual interest. An emerging individual interest is conceptualized as a particular relation of a person to content that is characterized by strong positive feelings for and knowledge—although there are some conceptual and methodological differences about the prominence of the role of knowledge for emerging individual interest.[1]

[1]Older students' and adults' knowledge about content has been assumed in some studies and measures focus only on the affective state of individual interest, whereas other studies account for the valuing, including feelings, and prior knowledge a person brings to engagement with particular content relative to his or her other activity.

In contrast, a well-developed individual interest describes a relation to a particular content for which a person has significant levels of both stored value and stored knowledge relative to the other content with which he or she may be engaged. The two phases of individual interest are temporally related. An emerging individual interest is a phase of interest development that emerges from a maintained situational interest, and may or may not transition into being a well-developed individual interest over time (Hidi & Renninger, 2003; Krapp, 2002b; Renninger, 2000).

The emergence of individual interest has been attributed to the ability to begin seeking answers to curiosity questions—the kind of questions that enable an individual to begin to organize information for him or herself (Renninger, 2000). This type of information builds on a person's positive feelings about content and his or her metacognitive awareness of what is known and what still needs to be figured out (Prenzel, 1988). Thus, an individual with a maintained situational interest for playing cards with family members, may begin to notice patterns in the play that need to be factored into the probabilities associated with people's bidding and may wish more information about probability in order to better his or her performance. This type of information seeking characterizes both types of individual interest. The person has ascertained particular information and has a sense of what needs to be figured out. In working with a content of individual interest, an individual is positioned to begin self-regulating behaviors (to seek additional information), experience feelings of self-efficacy, and have an understanding of the usefulness or importance of activity.

The two phases of individual interest are similar in that they can influence a person's attention and memory for tasks (Renninger, 1990; Renninger & Wozniak, 1985), the strategies they bring to learning (Alexander & Murphy, 1998; Alexander et al., 1997; Renninger, 1990; Renninger et al., 2002; Renninger & Hidi, 2002; Schiefele, 1996; Wild, 2000), and the likelihood that in these phases of interest, a person comes to identify with the content of individual interest (Hannover, 1998; Krapp, 1999, 2000, 2002a; Renninger, 2000).

These two phases of individual interest also differ. It is more likely that the person with a well-developed, rather than an emerging individual interest for particular content will persevere to work with content-related tasks despite the extent of the challenge and/or the temporary experiences of frustration such work represents (Ainley et al., 2002; Renninger, 2000; Renninger & Hidi, 2002; Renninger & Leckrone, 1991). This ability to work through frustration may indicate that the person with a well-developed interest for content is more resourceful in working with content than a person with a less-developed interest (Renninger & Shumar, 2002). It also suggests that a person is better positioned to anticipate next steps in the process of working with content of well-developed rather than emerging, or less-developed, individual interest.

Further, the support that a person in each phase of individual interest needs can also be expected to differ (Hidi & Renninger, 2003). A person with an emerging individual interest is likely to need external support to persevere in work with, develop resourcefulness for working with, and anticipate possible next steps or strategies to work with contents of interest. Whereas, a person working with a well-developed individual interest would not need such help. Instead, the person working with content of well-developed individual interest might instead need support in the form of models or others that allow his or her present understanding to be stretched (Renninger, 2000; Renninger & Hidi, 2002). Identification with well-developed interest enables a person to be both motivated and able to self-regulate his or her activity to make continued learning about content possible (Krapp, 2002b; Krapp & Lewalter, 2001; Renninger, 2000; Renninger & Hidi, 2002; Renninger et al., 2003).

CHALLENGES AND FUTURE DIRECTIONS

In this chapter, it has been argued that research on interest is positioned to make a significant contribution to understanding the functional relations among motivation, learning and emotions. Three features of interest based motivation set it apart from cognitively based motivational theories and call for the integration of the psychological aspects of interested engagement with findings of neuropsychological research. Specifically, (a) interest is content specific; (b) it evolves in the interaction of the person and his or her environment; and (c) it is both a cognitive and an affective variable.

Prior research has addressed the role of interest in text learning (Hidi, 2001; Schiefele, 1996, 1999), the interrelation between interest, personal goals, and self-concept (Hannover, 1998), and the effects of interest on learning at different developmental stages and across a variety of educational contexts, including preschool and elementary school (Renninger, 1992; Renninger et al., 2002; Renninger & Hidi, 2002), secondary school (Baumert & Köller, 1998; Renninger et al., 2003), college and university (Alexander et al., 1997; Harackiewicz et al., 2000; Krapp, 1997; Schiefele, 1999), and vocational education and training (Krapp & Lewalter, 2001; Krapp & Wild, 1998; Prenzel et al., 1998). A related line of research is focused on identifying mediating variables that can explain the (positive) effects of interest-based learning in terms of functional processes (Schiefele & Rheinberg, 1997). Mediating variables that have been analyzed in some detail include: attention (Ainley et al., 2002; Hidi, 1995; Renninger & Wozniak, 1985), learning strategies (Alexander & Murphy, 1998; Renninger et al., 2002; Renninger & Hidi, 2002; Wild, 2000), and emotional experiences (Ainley et al., 2002; Krapp & Lewalter, 2001; Lewalter et al., 1998; Renninger & Leckrone, 1991; Renninger et al., 2004; Schiefele, 1996; Schiefele & Csikszentmihalyi, 1994).

Recently, it has been suggested that the particular phase of interest under discussion influences the nature of the relation among motivation, learning, and emotions (Hidi & Renninger, 2003). For example, attention may be equated with the triggering of situational interest, but depending on the phase of interest being discussed, it may also be considered to be a mediator of the relation between individual interest and learning.

Missing in discussions of interest research have been detailed and well-founded analyses of the functional principles of interest-based learning. Why is it the case that students who have an interest for the content to be learned are more likely to reengage and learn that content more intensively and acquire a more interrelated knowledge structure for that content? What is the interrelation between interest as a content-specific motivational disposition and development from an ontogenetic perspective (see Heckhausen, 2000; Krapp, 2003). Answers to questions such as these appear to be within reach.

Interest research allows for the investigation of specific processes through which interest may influence learning and student achievement. For example, Ainley and colleagues (Ainley et al., 2002; Ainley, Hillman, & Hidi, 2002) investigated students' interests, affective reactions, persistence, and related learning outcomes. In these investigations, traditional self-report measures were combined with dynamic online recordings of students' affective and cognitive reactions while they were reading scientific and popular texts. The results showed that students' interest for the topics of the texts and their individual interest for the domain were related to their affective responses. Their affective responses were also associated with persistence and persistence was related to learning. Students who reported feeling interested were more likely to continue reading than students who were bored. Furthermore, online recordings of the affective reactions permitted identification of points in the text where (and when) student made decisions about whether to continue reading. Together with findings suggesting that interest impacts students' attention and memory for tasks (Renninger & Wozniak, 1985) and their depth of processing (Schiefele, 1999, 2001), it appears that interest makes a significant impact on intellectual functioning. Furthermore, the ability to sustain and develop new interest has also been associated with lifelong learning (Krapp & Lewalter, 2001; Renninger & Shumar, 2002; Snowden, 2001) and suggest that interest should have a central role in pedagogical practice.

As Berninger and Richards (2002) noted, academic tasks, emotions, and motivation are intricately linked with cognitive and executive functions in the neural circuitry that spans subcortical and cortical regions of the brain. There is, however, little in the way of information about ways to support the development of positive affect and motivation so that students who do not have interest for particular content can become academically motivated individuals (for exceptions, see Sansone & Smith, 2000; Sansone et al., 1992; Sansone, Wiebe, & Morgan, 1999). Work to support pedagogical use of situational in-

terest as a scaffold to engagement is a step in this direction (e.g., Hidi & Harackiewicz, 2002; Schraw & Lehman, 2001). As Renninger and Hidi's (2002) case study illustrated, however, students need to be supported over time in multiple ways if deliberate interventions with situational interest are to really have an impact on student learning. Case analyses of students' interest for learning in Latin and history classes further suggests that teachers have a pivotal role as supporters of students' developing abilities to develop an interest for content, and a love of learning more generally (Renninger et al., 2003). In particular, teachers are in a position to adjust their instruction to meet students' strengths, needs, and interests, and to structure the classroom environment so that students can learn (see related discussion in Turner et al., 2002).

Interestingly, however, it appears that interventions to support the development of interest, or love of learning, have primarily targeted older students and adults who because of metacognitive abilities, are also able to learn to self-regulate their learning if they have reason to do the tasks to be learned and take steps themselves to make these tasks more interesting (Renninger et al., 2003). It appears that next steps for interest research might address ways in which interest, as a locus of the integration of psychological and neuroscientific functioning, might inform and support conditions for learning that would both position and enable younger students to become more focused, motivated, and successful learners.

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