Computers & Education 54 (2010) 1127–1136

Contents lists available at ScienceDirect

Computers & Education

journal homepage: www.elsevier.com/locate/compedu

Causal attributions of success and failure made by undergraduate students in an introductory-level computer programming course

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ARTICLE INFO

Article history:
Received 13 June 2009
Received in revised form 25 October 2009
Accepted 31 October 2009

Keywords:
Post-secondary education
Interdisciplinary projects
Improving classroom teaching
Programming and programming languages
Pedagogical issues

ABSTRACT

The purpose of this research is to identify the causal attributions of business computing students in an introductory computer programming course, in the computer science department at Notre Dame University, Louaize. Forty-five male and female undergraduates who completed the computer programming course that extended for a 13-week semester participated. Narrative interviews were conducted to obtain their perceptions. While some research confirmed that the four most responsible causes for success and failure in achievement contexts are ability, effort, task difficulty, and luck, this research shows that in its context 'ability' and 'luck' were absent, and 'task difficulty' and 'effort' were almost absent. In all, participants made 10 causal attributions that were either cultural or specific to computer programming. The 10 causal attributions are 'learning strategy', 'lack of study', 'lack of practice', 'subject difficulty', 'lack of effort', 'appropriate teaching method', 'exam anxiety', 'cheating', 'lack of time', and 'unfair treatment'. All high achievers cited appropriate 'learning strategy'.

1. Introduction

The purpose of this research is to identify the causal attributions of business computing students in an introductory computer programming course, in the computer science department at Notre Dame University, Louaize. This goal is deemed important to practitioners by many authors (Alderman, 2008). Particularly, it is important to the researcher who has been teaching computer programming for more than 10 years. As an educator himself, he has a special interest in learning more about motivation of his students (Stake, 1995). As a teacher, he is committed to supporting his students in the successful completion of their computer programming courses. Further, academic achievement is a central concern at Notre Dame University, Louaize (Rahi, 2005).

The study outcomes can be used to suggest ways to energize unmotivated students such as attribution retraining programmes to provide better learning opportunities (Hammersley & Gomm, 2000). Knowledge of causal attributions and their underlying properties at an early stage of a course may help teachers use intervention strategies with students at risk of low achievement, especially those who hold self-defeating attributions. Hence, for a computer science department, the present study is crucial to improving teacher effectiveness and student learning.

Forty-five students volunteered to share their cognitive and affective experiences with the researcher. The majority of participants were males as was the business computing programme's population from which the sample was drawn and as was the computer science department's population which offers the programme. Participants' ages ranged from 19 to 26 years with an average of 21.7 years. The majority of participants were Lebanese as was the case with the business computing programme, the computer science department, and the University. To a great extent, the profile of the sample matched up with the population's profile.

2. Causal attributions

It is important to find the causes that students ascribe to an achievement outcome, such as passing or failing a course. The main reason is that causes play a major role in moulding future expectancies and emotions of learners that is their motivational states. The latter, in turn, determine learners' achievement strivings (Griffin, 2006). Causal ascriptions for an event may vary from one individual to another (Dörnyei, 2001; Elliott, Hufton, Willis, & Illushin, 2005). The original attribution model (Weiner et al., 1971) presented four causes as most

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doi:10.1016/j.compedu.2009.10.020

responsible for success and failure in achievement contexts: ability, effort, task difficulty, and luck (Seifert, 2004; Williams, Burden, Poulet, & Maun, 2004). In addition to the four typical attributions, authors reported causes such as mood, family background, and help or hindrance from other people (Dörnyei, 2001; Santrock, 2001). Furthermore, other research reported additional causes such as learning strategies (Alderman, 2008), teacher being clever, liking the content (Bornholt & Möller, 2003), fatigue, health, and teaching methods (Child, 1997). Hence, some research confirmed that the four causes that were foreseen as the most responsible causes by theorists were the most frequently attributed causes to success and failure by people. However, they are not the only causes adopted by attribution theory as some authors convey (Arnone, 2005). It is evident that there are many more causes to success and failure (Weiner, 2006). Therefore, researchers ought to use open-answer format questions in their attempts to find people's attributions to success and failure. Otherwise, restricting research to predetermined causes might yield wrong findings (Weiner, 1982) because it is enslaving to people's perceptions (Vispoel & Austin, 1995). Still, the small number of documented causes within the achievement domain by theorists and researchers serves as the building blocks for the likelihood of understanding motivation in achievement contexts related to computer programming.

3. Scarcity of research

As yet, there are no studies in Lebanon that support or deny the findings reported in the previous paragraph. Thus, this research and its findings will fill in gaps to present knowledge of motivation in the Lebanese context. In addition, while there are studies that examined causal attributions for achievement in subjects such as Mathematics (Bornholt & Möller, 2003) and English (Williams et al., 2004), there is none in the computer programming discipline. The main evidence of the scarcity of research in this multidisciplinary area are the advanced electronic searches that were performed on the following three databases British Education Index (1979 to July 2009), Australian Education Index (1975 to July 2009), and ERIC (1966 to July 2009) using the search terms 'attribution theory', and 'computer programming'. The search returned zero results. The lack of research shows the importance of the current study to the computer education field in particular and to the body of attribution research in general. In this respect, the study might uncover some problems that need further investigation.

4. Qualitative epistemology

Learning from business computing students themselves what they have constructed about their motivation from an attributional perspective is the basis for the understanding that this research seeks to provide. The study starts by listening to students about their lived experiences when they received their grades in the 'Computer Programming 1' course (Prior, 2004). Qualitative research is best fitted for this study since precise and substantial descriptions of the students' experiences from their own point of view are needed (Denzin & Ryan, 2007; Flick, von Kardoff, & Steinke, 2004). This route has the support of some researchers who concluded after the use of a simple open questionnaire in a study that investigated success and failure from an attributional perspective that a 'more in-depth interpretive research, possibly employing interviews to gain deeper understanding of the underlying reasons for learners' attributions, would certainly seem to be warranted' (Williams et al., 2004). Students' views cannot be detached from their unique and well-defined context (Ary, Jacobs, Razavieh, & Sorensen, 2006) and they cannot be quantified (Gillham, 2000). The thick descriptions emanating from subjective constructions of achievement outcome generated stocks of words which are qualitative evidence (Eisenhardt, 2006).

4.1. Number of interviewees

To provide insight on motivation in computer programming from an attributional perspective, participants from different achievement levels had to be interviewed (Merkens, 2004). Accordingly, the population was divided into five strata: high achievers (A+, A, A−), good achievers (B+, B, B−), satisfactory achievers (C+, C), passing achievers (C−, D+, D), and low achievers (F, UW). This classification conforms to the study of success and failure, the main events that trigger ascriptions in attribution theory (Eisenhardt, 2006). In addition, it ensures the inclusion of extreme and critical cases and revealing the range of differentiation (Flick, 2006). High and low achievers are extreme cases. Students who did not fail but passed the course with a below-average grade, i.e. passing achievers, are critical cases.

In qualitative research, there are no rules that help in determining the sample size prior to data-collection (Ary et al., 2006), but 'in a case study, the sample is small' (Gerring, 2007). Table 1 was prepared to help in determining the number of participants that should be selected from each stratum based on the percentages of strata in the population (Tashakkori & Teddlie, 1998). A sample of 45 students was believed to be suitable (Lichtman, 2006). First, it ensured the gathering of a wide range of experiences (Flick et al., 2004). Second, given the amount of time available for the research, 45 in-depth interviews produced a volume of data that can be transcribed, validated, analysed, and interpreted with quality (Ary et al., 2006; Platt, 2007). While interviews were conducted, some themes started recurring, especially with high and good achievers (Mertens, 2005). In fact, A+ and A are the same grade since each one is worth four points per credit. At

Table 1
Distribution of participants by achievement outcome level.

Achievement level/gender	Percentage in population			Number of participants in sample calculated from percentage			Number of recruited participants		
	Male (%)	Female (%)	Total (%)	Male	Female	Total	Male	Female	Total
High achievers	18.6	5.7	24.3	8.4	2.6	11.0	7	2	9
Good achievers	17.1	4.5	21.6	7.7	2.0	9.7	7	2	9
Satisfactory achievers	18.6	1.9	20.5	8.4	0.9	9.3	8	1	9
Passing achievers	10.7	3.0	13.7	4.8	1.3	6.1	8	1	9
Low achievers	19.4	0.5	19.9	8.7	0.2	8.9	9	0	9
Total	84.4	15.6	100	38.0	7.0	45	39	6	45