Investigating the Transitions between Learning and Non-learning Activities as Students Learn Online

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Many students today utilize the internet to help them accomplish their learning goals. However, when they learn at home they are in total control and it is easy for them to visit websites not related to learning when they lose focus or are not motivated enough to learn. Observing affect further will help us understand the transitions between learning and non-learning activities when students learn online. To achieve this, we collected affect and activity transition data from students learning online at home. D'Mello's likelihood metric was modified to compute the likelihood of transitioning between activities and their corresponding affective states. Results showed that students not only shift to non-learning activities after experiencing negative affective states, but also positive affective states plausibly when learning goals are completed. Also, despite engaging in non-learning activities, students resumed learning and even experienced positive affect which is beneficial to learning.

Key Words and Phrases: online, learning, non-learning activities, affective states, transition likelihood

1. INTRODUCTION

Information seeking is a major part of online learning since it allows students to find resources needed to accomplish their learning goals, using online tools and collaborating with peers [Smith and Caruso 2010]. Students can use these tools not only in school, but also at home while doing homework and projects or studying for quizzes. At home, however, students have complete control over their learning process and do not engage in learning related activities alone but also shift into non-learning activities.

In [Luo et al. 2011], students tasked to seek information on the internet experienced transitions in affective states which played a role in how they proceeded next. For example, students who experienced excitement when feeling they were on the right track proceeded with the task assigned to them, but showed confusion and frustration when they were not able to find what they expected and later gave up. Since learning online consists mostly of information seeking, we expect that it is influenced by affect. Also, since students have complete control in this domain, affect may not only influence learning but also their shifts to non-learning related activities. When experiencing frustration, they can easily browse game or media websites to de-stress and alleviate negative affect.

Observing affect will help us understand the transitions between learning and non-learning activities when students learn online. We collected data from students learning at home where there were no observers, specific goals or time frames given to ensure that they felt total control over their own learning. However, they were asked to install a web browser plugin which showed a popup window every time they viewed a webpage asking them to annotate the type of the activity (i.e., learning related or non-learning related) and the most pronounced affective state they were in (i.e., delighted, engaged, neutral, bored, confused, frustrated). Information about their browsing behavior and their annotations were sent via internet into a web server to collect the data.

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2. RESULTS AND ANALYSIS

The transitions between learning and non-learning activities with their corresponding affective states were analyzed using a modified version of D'Mello's likelihood metric [D'Mello et al. 2007]. Equation 1 measures the likelihood of transitioning between an activity and a corresponding affective state to another.

$$L_{Act1,AffSt1 \rightarrow Act2,AffSt2} = \frac{Pr(Act2, AffSt2|Act1, AffSt1) - Pr(Act2, AffSt2)}{(1 - Pr(Act2, AffSt2))} \quad (1)$$

A value above 0 indicates a likely transition with increasing likelihood as it approaches 1. Zero indicates likelihood that is at the chance level. A value below 0 indicates that the transition is less likely than the base rate of the next activity with its corresponding affective state. The modified likelihood metric was used on all student data to compute the likelihood of transitioning between all combinations of activity and affective states. Likely transitions important to the study are shown below.

Table I. : Mean transition likelihoods of all student activities and affective states. (L = learning; NL = nonlearning; D = delighted; N = neutral; E = engaged; C = confused; B = bored; F = frustrated)

(a) L → L

	LD	LN	LE	LC	LB	LF
LD	0.01					0.03
LN	0.05					
LE	0.03	0.002	0.01	0.04	0.01	
LC	0.02			0.03		
LB					0.12	
LF						0.07

(b) L → NL

	NLD	NLB	NLF
LD	0.02		
LN	0.03		0.04
LE	0.02	0.01	
LC			0.041

(c) NL → L

	LD	LB	LF
NLE	0.04		0.01
NLC		0.01	

Results show that as students transition between activities, they are likely to experience changes in affective states. Both positive (i.e., delighted, engaged) and negative affect (i.e. bored, confused, frustrated) were likely to persist and may either motivate students or cause them to give up as was described by [Luo et al. 2011]. When students experience confusion, they are likely to transition into non-learning activities which may indicate the point when they fail to accomplish their learning goal and give up. Interestingly however, even if students experienced positive affect while learning, it was likely for them to transition into non-learning activities. This may mean that either they engaged in non-learning activities after completing their learning goal, or non-learning activities served as distractions while they were learning. Non-learning seems to have helped students since it was likely for them to transition back to learning and they were even brought to a positive state (NLE → LD) which is advantageous to learning. However, it was also likely that non-learning activities may have caused the student to lose interest in learning (NLC → LB), or dislike learning (NLE → LF) because they were more engaged in non-learning. Although affect can provide possible explanations for activity transitions, further research is needed to verify them. Since affect does not fully explain the transitions, it is also worthwhile to explore other factors that may influence these transitions.

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