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Learner Control, Willingness to Pay and Reservation Wages

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Abstract

This paper investigates whether increasing the amount of control a learner has in his/her learning increases his/her willingness to pay for that learning, or his/her reservation wage for a topic related task. Using a small scale online experiment, separating participants into two groups, each corresponding to a different treatment; one with control and one without, this paper found no significant difference between the two groups in their willingness to pay for learning how to play chess. However, when using OLS regression with some additional control variables (gender, age, academic ability, a specific desire to learn the study topic and a preference for self guided tuition), being in the treatment group with some control was found to have a negative effect on participants' reservation wage for a topic related task. This was significant at the 10% level. Additionally, when using perceived control as the measure of control rather than the treatment group, this paper found that having a greater sense of control had a small positive effect on willingness to pay for learning at the 1% significance level. However this paper acknowledges that the sample size is too small for the results to be conclusive, but suggests that relationship between learner control, willingness to pay for learning and subsequent reservation wages warrants further investigation.

1. Introduction

This paper seeks to investigate whether increasing a learner's control over the content of their learning increases their willingness to pay for that learning, and their subsequent reservation wage for a topic related task. That is, if a learner is given more control over the content of his/her learning, will this learner be willing to pay more for it and will this learner have a higher subsequent reservation wage when offered a job related to the topic of the learning? It has been shown in the field of consumer psychology that giving an end user more control over the product via self-customisation results in a significant value increment over the standardised version of the product. This paper investigates whether a similar phenomenon is present when the consumer is a learner and the product is his/her education.

Globally, education is a sector that has lagged behind with regard to integrating and utilising new technology (Ertmer, 2005). Education philosophy has not changed much in the past few decades and neither have methods of instruction (Paige, 2008). However, the instances when attempts have been made to integrate new technologies into methods of education have had interesting results. Sugata Mitra's "Hole in the Wall" experiments in the late '90s and early 2000s achieved some success in teaching children computer literacy. These experiments consisted of giving local slum children in New Delhi access to a computer without any instructions. The children became computer literate on their own and they were also able to improve their English speaking, their mathematics and science test scores and learn how to search the internet for answers to a question (Mitra, 2010). Notably, without the input of teachers or parents, these children had full control over what they learned. This is in stark contrast to traditional methods of public education.

Another example of the success of this new approach is the case of Paloma Noyola Bueno. In October 2013, she made international headlines, when taught via methods inspired by Mitra's work, she achieved the highest score in Mexico in the national two-day standardised exam for 12 year olds. This is remarkable because prior to being introduced to this new method, Paloma was not a standout student. Moreover, in her class, the new method reduced failure rates of that exam almost tenfold in Spanish and almost sevenfold in mathematics (Davis, 2013).

This alternative approach to learning, and others that are similar, have come to be known as *minimally guided tuition*, or *discovery learning.* However, they are not without their detractors (see for example Kirschner *et al*. 2006). Existing literature is divided over the efficacy of such learning practices when compared to traditional guided instruction and thus, minimal guided tuition has proven itself a topic worthy of debate.

It is important to note that there is no universally accepted definition of minimally guided tuition or discovery learning. Rather, learning methods can be viewed as being on a spectrum with direct guided instruction on one end and pure discovery at the other (Brunstein *et al.,* 2009). Of course, all pragmatic learning practices will incorporate some discovery learning and some direct guidance; the question is what particular blend works best? Despite the limited implementation of discovery learning, the purported success of the aforementioned examples suggests that further investigation is warranted. This begs the question, what are the key distinctive features of discovery learning that separate it from the so called traditional methods?

One key distinction that is immediately evident, is the *control* of the learner in determining what they will learn. Of course it has always been possible for a student to supplement their learning using material from other sources, however, the limited availability of such material has been restrictive. Today technology has created the possibility for such material to be available to everyone at any given time and in any given location. Thus the ability to direct one's learning becomes all the more integral.

The majority of the literature on the relationship between control, customisation and valuation is in the field of marketing and consumer psychology, and the focus of interest has generally been the consumer and their WTP for some product. If we look at a learner as the consumer and we consider an improved version of themselves as the product, then increased control in the learning process can be seen as analogous to user customisation of an end product. Research on this topic has shown that giving an end user more control in the design of the product increases its value (See

Franke *et al*., 2010 & Schreier, 2006). In the absence of existing literature such an effect would appear to be counterintuitive; that a consumer would be willing to pay more and *do* more with respect to the creation of the final product. However, the literature tells us that by customising a product the consumer effectively increases their preference fit of the product, which in turn increases WTP and additionally, the act of customisation itself gives the consumer an increased sense of perceived ownership which also increases WTP (Schreier, 2006).

It has been argued that these alternative methods are confined to the fringes and that their alleged benefits have not been widely supported by empirical evidence (Kirschner *et al*., 2006). However, irrespective of whether such practices ever become mainstream, the technology exists for learners to easily supplement their education or replace it entirely, using such methods or methods of their own. Technology will continue improving and access to the internet will continue to spread, so an increasingly greater number of people will have instant access to information and educational resources. Thus the option and capacity to choose if and how to supplement a learner's education will become increasingly prevalent. These considerations will be of importance to governments designing public education programs, to businesses interested in training workers, and even at the individual level when choosing which school to attend, if even to attend school at all. The perceived value of alternatives to guided instruction will have implications for the pricing strategies of competing methods of education, as well as who should bear the financial burden for them. There is of course always the possibility of implementing minimally guided learning itself on a mass scale.

In light of this debate, this paper posits that:

a) Increasing learner control increases the learner's willingness-to-pay for the learning.

b) Increasing learner control increases the learner's subsequent reservation wage for a topic related task.

In this study a small scale experiment was conducted online, in which participants were split into two treatment groups, one in which they had *some control* over their learning and one in which they had *no control*. They learned the basics of chess, then their willingness to pay for what they learned and their reservation wage for a chess related task were directly elicited via a questionnaire. Using this method, this study arrived at the following results:

1. When the willingness to pay was adjusted, taking into account relative price levels of the respective participant's home countries, there was no significant difference between the two groups.
    i. The group with some control exhibited a lower willingness to pay (M = €11.34, SD = €11.75) than the group with no control (M = €16.98, SD = 10.85), $t(16)$ = 1.06, p > 0.10. Using the unadjusted WTP values gave a similar result.[1]
2. When perceived control, rated by the participant on a scale of 1 to 10, was used as the explanatory variable (with some additional control variables), it had a coefficient of 1.76 (SD = 0.39, $t\text{-statistic}$ = 4.55, p < 0.01) when regressed against the adjusted willingness to pay. The unadjusted WTP values gave a similar result. This indicates that the participants that felt they had more control over what they learnt in the study were willing to pay more.
3. With respect to reservation wages, using values adjusted for relative wage levels, there was no significant difference between the two groups.
    i. The group with some control exhibited a lower reservation wage (M = €10.94, SD = 4.88) than the group with no control (M = €15.39, SD = 5.60) $t(14)$ = -1.66, p > 0.10.
4. When the control group, specified as a dummy variable, is regressed using OLS against adjusted reservation wages (with some other control variables), being in the group with some control is shown to have a negative effect on reservation wage. That is, participants in this group were willing to do the chess related task for less. The coefficient was -4.52 (SD = 2.26, $t\text{-statistic}$ = -2.00, p < 0.10). Using perceived control, instead of treatment group, there was no significant effect.

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[1] Participants came from 11 different countries and stated WTP in the currency with which they were most comfortable with. This was converted into euros, then adjusted to represent the comparative price level of the participant's home country. Sweden's price level was used as the base.

The results given above should be taken with caution. The size of the sample used in this experiment was very small ($N = 24$), making the results particularly susceptible to errors and rendering the outcome of this investigation not conclusive or definitive. A replicated experiment with a much larger sample size, may or may not present the same results. As a consequence, this experiment is not particularly useful if one tries to generalise its findings. Rather, the experiment should be seen as preliminary; one that investigates whether the relationship between learner control, willingness to pay and reservation wage warrants further research. The results indicate that the treatment group had no significant effect, with the exception of the adjusted reservation wages; however this may be due to flaws in the design of the experiment, rather than the actual absence of a relationship. Additionally, the distinction between the two groups' reservation wages may also not be representative, due to the small sample size. The fact that the effect of perceived control on willingness to pay has been shown to be significant whereas the treatment group has not, suggests that distinction in the amount of control between the two groups was inadequate. These implications and further limitations of this study are discussed in section 6.

This paper is divided into 7 sections. Section 2 discusses the existing literature on this topic, section 3 details the design of the experiment used to gather the data for this study, section 4 details the method used to estimate the relationship between the variables, section 5 gives a comprehensive overview of the results, section 6 discusses the implications and limitations of this study and section 7 contains the conclusion.

2. Existing Literature

Despite the fact that few empirical studies have been done investigating learner control and valuation, previous literature on these topics provides insight into the mechanisms at play. There has been extensive research into consumer control in the user customisation of end products and this research has shown that customisation does indeed increase the consumer's WTP regarding the product in question (Frank

& Piller 2004). This value increment has been attributed to several factors and broken down into various components. Importantly, it has been demonstrated that labour alone, even if mundane and unenjoyable, is sufficient to increase a consumer's WTP (Norton *et al.*, 2011). Put differently, requiring effort in the construction of the final product *increases* its value. This seemingly counterintuitive link has been investigated by researchers exploring effort justification. Generally, this research has demonstrated that the more effort people put into some pursuit, the more they come to value it (Festinger 1957).

It has been shown that even in the world of nature animals exhibit similar behaviour. One study showed that despite animals preferring to exert less energy, requiring more effort to obtain food at a particular location appears to increase the value of that location (Friedrich & Zentall, 2004). This phenomenon; that mixing one's labour with something increases its perceived value for the labourer, is of importance because in order to investigate the effect of learner control effectively, this aspect and its effects need to be distinguished accurately. Indeed it can be put forth that increasing control constitutes increasing input, however, input can be increased without any increase in learner control — thus the distinction is relevant.

Importantly, the presence of an increase in perceived value has been shown to be contingent on successful completion of the relevant task. Failure in the task has been observed to correlate to no increase in valuation (Norton *et al.*, 2011).

The age of the learner is also relevant. Despite proponents of discovery learning citing anecdotal evidence involving primarily young children (for example Davis, 2013 & Mitra, 2005), much of the empirical research on the topic has used college students as the participants (for example Brunstein *et al.*, 2009 & Carlson *et al.*, 1992). Ideas such as perceived ownership and pride are components posited to contribute to the value increment, and thus age is of concern because these things are present in differing levels in different age groups. More importantly, as the research has generally been done on college age students; it is possible that participants of other ages and from different sectors of society, may exhibit different behaviour.

Incidentally, anecdotal evidence appears to indicate that discovery learning favours learners of greater ability and of a higher level of previous knowledge regarding the education material. This apparent trend has also occurred in research — brighter students appear to benefit more from discovery learning than the less able ones (Clark, 1982). Even Kirschner, an outspoken critic of discovery learning states in the abstract of his well-known paper on the subject, that the "*advantage of guidance begins to recede…when learners have sufficiently high prior knowledge to provide 'internal' guidance*" (Kirschner *et al*., 2006)*.* This is an important point because perhaps if not used for anything else, discovery learning can be used as a tool to stimulate the smarter learners in a class, or even as a measure of whether the current curriculum is advanced enough for the learners.[2]

In the field of cognitive science, controlling one's observations, as opposed to having them controlled by someone else, has been shown to elicit more cooperation between the hippocampus and other parts of the brain involved in learning; but more importantly, in the study in question, subjects posted a 23% increase in the ability to remember objects (Voss *et al.*, 2011).

In the majority of the previous research, willingness to pay has been used as the measure of the consumer's valuation and this has been elicited in various ways such as the Becker-Degroot-Marschak method (see for example Norton *et al.*, 2011), variants of Vickrey auctions (e.g. Schreier, 2006), and contingent valuation methods (e.g. Franke & Piller, 2004). These methods are sufficient as they have been shown to accurately ascertain an individual's true valuation of a product.

Control has often been investigated in previous literature in a way relevant to the product being studied. Participants have mostly been asked about their valuation of a product that they themselves have customised, and this value has been compared with how much other participants value that product (given that they had no part in its customisation) and how much participants value standard, non-customised products.

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[2] If discovery learning is implemented and there is a substantial increase in the performance of students, then perhaps the existing curriculum was not challenging enough for them. This may have indeed been the case for Paloma Noyola Bueno.

Thus in much of the previous literature, control has often been limited to two conditions; one in which the participant has control and one in which the participant does not. A similar method has been used for this paper; the difference being the products being valued.

This study seeks to investigate the direct link between learner control and the learner's valuation of the learning, an investigation that has thus far not been undertaken. It also aims to test the efficacy of different levels of control, if albeit in a limited manner. The objective of this paper is to gain a better understanding into how changes in learner control affect the valuation of not just the learning itself but of the learner's valuation of himself or herself as a 'graduate' of the 'program'.

To date, there is no consensus regarding the effectiveness of discovery learning, with proponents arguing for its benefits (e.g., Mitra 2010, Brunstein *et al*., 2009) and detractors arguing against (e.g., Kirschner 2006, Klahr & Nigam 2004). Proponents cite anecdotal evidence of real life examples. Detractors cite cognitive architecture and empirical studies that claim to refute the alleged effectiveness of discovery learning. Yet there have been studies within the field cognitive science that appear to suggest a natural affinity for discovery learning (see Cook *et al*., 2011), just as there are some that suggest it is inferior to direct guidance (see Klahr & Nigam, 2004). Nevertheless, empirical research on the topic is scarce, a fact that weakens conclusions drawn for or against the effectiveness of discovery learning. The likely cause of this is that there are several factors and components at play when the amount of learner control is varied, such as effort, responsibility and ideas about ownership. Many of these factors can have complex effects on each other with respect to the effectiveness of the learning, as well as the learner's enjoyment and subsequent valuation. Until more research is done, there can be no definitive answer to the question of how effective discovery learning is. Nevertheless all existing literature has been used to guide the design of this study, and the considerations of its results.

3. Experimental Design

This section explains the participant's involvement in the experiment used to gather the data. Two websites were created for the experiment; one where participants would sign up and one where they would complete the experiment. Prospective participants would enter their email address on the sign up page and each email address entered would be randomly assigned a participant number. Each participant number designated a treatment group and tracked the participant throughout the experiment, whilst also giving them anonymity.

The participant was emailed their participant number along with comprehensive information about the study and a consent form. They were informed in the email that by continuing with the study, they were giving their consent to participate (this email is included in the appendix). The email contained a link to the relevant starting page for the participant, as determined by their treatment group — a different page for each treatment group. On the landing page the participant would be presented with information about each section of the study, how long it would take and what they were required to do. There were four sections in total; the preliminary questions, the learning portion, the learning assessment and the follow-up questionnaire.

The preliminary questions section served to ascertain the initial knowledge of the learner upon beginning the experiment. Participants were informed that if they were already proficient in playing chess, or played recently and/or frequently, they would not be allowed to participate in the experiment. Following this, participants answered some preliminary questions. Some of these questions regarded how recently they had last played chess, if ever, and some were on the basic facets of the game.

Once the participants had answered the preliminary questions they went on to the learning portion of the experiment. The content covered the basic rules and facets

of chess, and included animated examples, as well an embedded chess game at the end that participants were able to use to practice playing against a computer opponent. The information was exactly the same for the two treatment groups. The treatment groups differed, however, in how this information was presented to them.
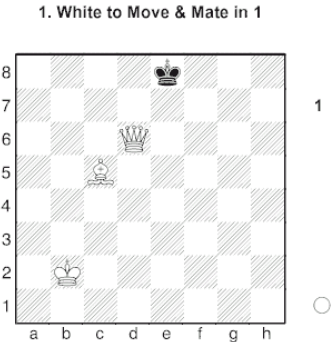
Figure 1: An example of a preliminary question

In the first treatment group, '*no control*,' the information was presented in a series of ordered webpages that the participant was informed to go through one by one. Participants were allowed to go back and review previous webpages but as they were not explicitly given the URLs they could not skip ahead — at the very least they would have to visit each webpage, even if they did not pay attention.

In the second treatment group, '*some control*,' the participants were first informed to think about the various things they might want to know in order to learn how to play any game in general, then specifically in the context of chess. Following this, they were directed to a landing page displaying a grid of all the topics available to learn — the same topics as in the group with no control (see Figure 2). This grid

was randomly ordered in one of three different ways and participants were informed of this, and that they would have to decide which order they wanted to look at the topics. Thus they had control over the order in which they learnt. In this group participants were also able to skip topics; thus they also had control over the content.[3]

The Bishop	The Queen	The King	The Rook
Initial Setup	Special Moves	The Game of Chess	The Knight
Pawns	Basic Gameplay	Basic Strategy	How the Game is Won & Draws

When you have looked at every section that you think necessary, please click here to move on to the assessment portion of the study.

Figure 2: Grid layout presented to the group with some control

After the learning portion participants moved on to the assessment portion of the study. This assessment consisted of a multiple choice questionnaire, of which the highest possible score was 16. Participants would complete the assessment then

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[3] Ideally, the difference in the amount of control given to the participants in the two groups should have been greater. Initially it was intended that the webpage would present the participants with open questions, which in the process of answering they would discover the relevant content. This would have been truly similar to the techniques promoted by Mitra and other discovery learning enthusiasts. Such a webpage would also give the participants the additional possibility at the end to see a grid with all the contents — to make sure they did not miss anything by chance, rather than by choice. This could have also been a third treatment condition. However, as this researcher is not proficient in computer programming, designing such a website was not feasible. Furthermore, it was anticipated that participant numbers would be small and having three treatment conditions instead of two would have meant even fewer participants per condition and this would have made the experiment less valid.

have their scores emailed to them before moving on to the follow-up questions. The follow-up questionnaire contained questions pertaining to any information that might affect the treatment variable. A copy of this questionnaire is provided in the appendix. Once the participant had completed the follow-up questionnaire, their involvement in the study was over. They were given the link to a webpage where they could enter their email address again if they wanted to be included in a prize draw for a 300 SEK iTunes gift voucher.

Procedures

All the data used in this research was collected via the experiment detailed above. Participants were recruited by sharing the link to the sign up page. This link was shared on social media sites such as Facebook, Twitter and Reddit, and sent directly to students using the university's student directory. In total, there were 24 participants (18 female, 6 male, M_{age} = 24.2 SD = 4.4). The mean time taken by all participants to complete the learning portion of the study was 37.56 minutes (SD = 15.89). In the first treatment group, *'no control,*' there were 12 participants (9 female, 3 male; M_{age} = 25.50, SD = 4.87). The mean time participants in this group took to complete the study was 36.22 minutes (SD = 15.13). In the second treatment group, '*some control,*' there were 12 participants (9 female, 3 male; M_{age} = 22.92, SD = 3.55). The mean time participants in this group took to complete the study was 38.89 minutes (SD = 17.41), slightly longer than the treatment group with no control, although this difference was not significant.[4]

The results were analysed using various statistical methods. A two tailed t-test for equality of the means and a non parametric test for equality of the medians was conducted between the two treatment groups. OLS regression was used to investigate the influence of perceived control on willingness to pay, and to estimate the influence of perceived control and treatment group on the reservation wages.

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[4] 6 observations were omitted (3 in each treatment) because they took breaks during the learning portion, some as long as ten hours. However, time taken to complete the learning portion was not found to have a significant effect on WTP or reservation wage.

Variables

Willingness to pay was directly elicited from participants' responses in the follow-up questionnaire using a variant of the Becker-Degroot-Marshak technique.[5] The participant's reservation wage was also directly elicited from the follow-up questionnaire. Participants were told to imagine that the researchers conducting the study were developing an online chess game and wanted to test the software against human participants. They were informed that this work could be tedious and testers would be required to log up to 40 hours of work. They were asked what minimum hourly wage they would require to do such work.

Each participant was given a score on a scale of 1 to 100 for their starting proficiency, denoted SP_i. This score was created using a combination of the participant's score on the preliminary questions, and how recently they last played chess. Their end proficiency, denoted EP_i, was measured by participant's scores in the learning assessment converted into a percentage.

How much the learner enjoyed the learning in the study was measured on a scale of 1 to 10 as rated by the participant in the follow-up questionnaire. This variable has been denoted as LE_i. Additionally, a dummy variable *enjoy_learning_i* was created using responses from the follow-up questionnaire, asking whether the participants enjoyed learning in general, where yes = 1 and no = 0. The financial background of the learner, denoted FB_i, was measured on a scale of 1 to 3, with participants self-selecting their after-tax income bracket in the follow-up questionnaire. Additionally the participants were asked if they considered themselves careful with money and a dummy variable *thrifty_i* was created with yes = 1 and no = 0. The effort exerted by the participant was self-assessed by the

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[5] Participants were asked to imagine that the learning portion of the study was to be developed into an introductory class in a series of 10 to learn how to play chess from a novice to an advanced level. They were asked to imagine that places to this class would be limited and an auction would be held to determine who could participate. Every individual would place a bid, and from these bids, one would be chosen at random. All individuals who had bids higher than the randomly selected bid would be allowed to participate and all individuals who had lower bids would be excluded. Participants were asked to state the maximum they would bid in such a scenario or state that they would not be willing to make a bid. Participants were told to state a bid between €3 and €30 in order to give them an idea of how much such a class would cost, otherwise their stated values may have just been a reflection of how much they believed such a class would cost, or how much others would pay, rather than how much they would be willing to pay themselves.

participant on a scale of 1 to 10 and used as the variable E_i. Of course, this is a proxy, as the participant cannot give an objective, comparable measure of how much effort he or she actually exerted.

In the regressions, control was measured in two ways; firstly using the treatment group as a dummy variable then secondly using the participant's rating on a scale of 1 to 10 of how much control they felt they had over what they learnt in the learning portion. The participant's general academic ability, denoted AA_i was also measured in two ways. Participants were asked the highest level of schooling they had completed, then given a rating of 1 to 4 for *education level$_i$* and they were also asked if they were above or below average students throughout their schooling and given a rating on a scale of 1 to 5 to create the variable *student level$_i$*.

As the participants in this study came from 11 different countries with different comparative price levels, and different relative wages, several variables had to be converted into euros to make them comparable. Participants were asked to state values in the currency that they felt most comfortable with and these values were subsequently converted. With the willingness to pay values, this created a new variable *unadjusted willingness to pay$_i$*. This variable was then converted again using the comparative price levels (OECD, 2013) from the participant's respective countries. This created the variable adjusted *willingness to pay$_i$*. Reservation wages were also converted in the same fashion, however for the latter, they were converted using the relative wage rates (ILO, 2013) instead.

Additional dummy variables were created for all the responses that separated participants into categories; their country, their reason for entering the study (to learn chess or for other reasons), their gender, etc., (see appendix for specific questions). The following variables proved relevant at some stage during the study.

USA is the dummy variable representing participants that came from the USA. There were dummy variables for each of the other 10 countries participants came from, however none of them proved relevant. *Desire chess$_i$* is the dummy variable assigning a 1 to those participants that entered the study because they wanted to learn chess and 0 to participants that entered the study for other reasons. *Female$_i$* is the dummy variable for the gender of the participants. *Practice$_i$* captures whether or not the participant used the chess games embedded in the learning portion to practice. *Age$_i$* is simply the participant's age. Finally s*elf-preference$_i$* is the dummy variable capturing whether or not participants preferred to study on their own or receive direct guidance.

4. Estimation

This section details how the relationship between the variables was estimated. There are two research questions; does increasing control a) increase a learner's willingness to pay for the learning and b) increase their subsequent reservation wage for task related to the topic of learning? However, as the inputs in the two questions are similar the difference between them is minimal — primarily in the dependent variables. In the first instance the dependent variable is WTP and in the second instance it is the individual's reservation wage. Surprisingly there seems to have been little research done into individual WTP for education. Most of the literature on fees regarding schooling focus on the question of whether or not it is economically beneficial for the student from an objective standpoint. However, there is an absence of research that looks at the subjective factors at play that influence how much a prospective student would be willing to pay for education. Such research would have been extremely useful in guiding this study. Similarly, research into reservation wages is not particularly helpful here as it has mostly focused its relationship to job searching and unemployment, and not to prior education. Thus this study proposed the following estimation method, that was later adjusted accordingly:

1)   Willingness-to-pay$_i$ = β_0 + β_1Control$_i$ + β_2(EP$_i$-SP$_i$) + β_3LE$_i$ + β_4FB$_i$ + β_5AA$_i$ +

$$\beta_6 E_i + \varepsilon_i$$

2)   Reservation wage$_i$ = β_0 + β_1Control$_i$ + β_2(EP$_i$-SP$_i$) + β_3LE$_i$ + β_4FB$_i$ + β_5AA$_i$ +

$$\beta_6 E_i + \varepsilon_i$$

- where *SP$_i$* is the starting point of the learner, their proficiency before the learning process, as measured by a test before commencement of learning.

   EP$_i$ is the end point of the learner, their proficiency upon completion of the learning process.

   LE$_i$ is the learner enjoyment; how much the learner enjoys the process of learning itself as rated by the participant on a scale of 1 to 10.

   FB$_i$ is the self-reported financial background of the learner.

   E$_i$ is the effort on the part of the learner during the learning process, measured subjectively.

   Control$_i$ is control, the treatment variable.

   AA$_i$ is the self-reported academic ability of the learner.

Regarding the starting point and the endpoint; any learner is paying to acquire skills and knowledge and the amount acquired is dependent upon the starting point and measured in its relation to the finish point. It is likely that the greater the difference between the two, the more an individual will be willing to pay to cross that gap. An example of this is someone that pays for driving lessons. An absolute novice will require more driving lessons to become competent than someone who already has some driving experience. More lessons equate to more money and thus the novice pays more to reach the same outcome as the experienced driver — that is, to become a qualified driver. The same could be said of paying for private tutoring or learning a foreign language. However these differences are not absolute, and are likely to vary largely from individual to individual. Additionally, beginners are likely to know less about how much tuition they need in comparison to those who already have some tuition — their willingness-to-pay will be speculative more than anything else. This study is limited in this regard; that there is uncertainty regarding the product the consumer is willing to pay for. They don't know how much of it they need,

nor do they know how much of it they will actually be getting (their final grades in an exam, or a pass or fail in a driving test).

It is interesting to note, however, that with regard to schooling, individuals are charged a flat rate for their education irrespective of their initial proficiency. Research is yet to be done to investigate whether less able students would be willing to pay more to achieve the same grades. Nonetheless, in the absence of this research, these variables have been included in the model. The existing literature indicates that the existence of the value increment, at least concerning self-customisation of consumer products, is contingent on *successful* completion of the task — that is, putting together the product successfully. Thus it is likely for any effect to be present here that the participants have to at least think that they were successful in their learning. Some of the more confident participants may believe this of their own accord, however it is preferable to give the participants an objective measure of their success, so that their beliefs are not completely erroneous. In particular, deciding on a reservation wage will depend on how much the participant perceives their value as a labourer to be. Their *perception* of their proficiency is important here. Informing them of their objective level of success primes them to perceive that their proficiency is at a similar level, and there is no reason to believe that difference between their true level and their perception of their level is correlated with any of the other independent variables. Thus their objective level can be used as an effective proxy for their perceived level, but only once they have been informed of it.

Learner enjoyment is important because it may have a direct effect on the individual's willingness to pay. It may also have an indirect effect of increasing the final level achieved. It has been shown that absence of enjoyment is still enough to induce a value increment in the creation of self-designed or customised products (Norton *et al*., 2011), however there has been no indication in research that more enjoyment negatively affects willingness to pay.

The financial background of the learner is important because it determines their disposable income, which determines how much money they actually have to spend on learning, and subsequently their WTP for the learning.

Effort is important, as mentioned earlier in the section on existing literature. Extra effort alone has been shown to increase willingness to pay. However, measurement of this variable in this study can only be subjective, as an objective measure would require some sort of body monitoring equipment (brain wave monitoring, for example), and that is not feasible in this investigation. Control, of course is the treatment variable. It is measured in two ways in this study. Firstly by treatment group, in which case a dummy variable was assigned, equaling 1 for the group with some control and 0 for the group with no control. Secondly, by perceived control, as rated by the participant on a scale of 1 to 10.

Investigations into reservation wages would usually include variables such as employment benefits and other employment available to workers, however in this instance, the job in question would be a one-time event, taking up very little of the worker's time. Additionally, the money gained would be negligible compared to the worker's annual wages or unemployment benefit, thus reducing their relevance here. Again, assessing the effect of control is the primary objective here, and it is the comparison between the groups that matters more than the individual magnitudes.

5. Results

This section looks at the results of the analysis. When the figures are adjusted to take into account relative price levels of the participant's home countries, the group with some control exhibit a *lower* willingness to pay (M = €11.34, SD = €11.75) than the group with no control (M = €16.98, SD = 10.85), however this difference is not significant $t(16) = 1.06$, $p > 0.10$ (see table 1). Using the unadjusted WTP values, the group with some control again exhibit a lower willingness to pay (M = €10.99, SD = 8.35) than the group with no control (M = €13.73, SD = 8.99), again this difference is not significant $t(22) = 0.78$, $p > 0.10$ (see Table 2). In the tables the subscripts NC and SC stand for *no control* and *some control* respectively. Using a Mann-Whitney test also reported no significant difference between the two groups $U = 1.46$, $p > 0.10$ when using the adjusted WTP and $U = 0.98$, $p > 0.10$ when using unadjusted values.

Table 1: Comparison of adjusted WTP using two tailed t-test

Variable	Count	Mean (in €)	Std. Dev.	Std. Err. of Mean
Adjusted WTP$_{NC}$	9	16.97534	10.85115	3.617050
Adjusted WTP$_{SC}$	9	11.33876	11.74463	3.914877
Both	18	14.15705	11.34600	2.674279

$t(16) = 1.06$, $p = 0.31$[6]

Table 2: Comparison of unadjusted WTP using two tailed t-test

Variable	Count	Mean (in €)	Std. Dev.	Std. Err. of Mean
WTP$_{NC}$	12	13.73434	8.984892	2.593715
WTP$_{SC}$	12	10.98748	8.348048	2.409874
Both	24	12.36091	8.596945	1.754844

$t(22) = 0.78$, p = 0.45

With respect to reservation wages, using values adjusted for relative wage levels, the group with some control exhibited a *lower* reservation wage (M = €10.94, SD = 4.88) than the group with no control (M = €15.39, SD = 5.60) but this difference was not significant $t(14)$ = -1.66, p > 0.10. Using the unadjusted reservation wages returned a similar result (Tables 3 & 4 respectively). Again, these results are supported by the Mann-Whitney test, which also reported no significant difference U = 1.06, p > 0.10 for adjusted reservation wage and U = 0.18, p > 0.10 for unadjusted reservation wage.

Table 3: Comparison of adjusted reservation wage using two tailed t-test

Variable	Count	Mean (in €)	Std. Dev.	Std. Err. of Mean
Adj. reservation wage$_{NC}$	9	15.39111	5.603705	1.867902
Adj. reservation wage$_{SC}$	7	10.94429	4.877673	1.843587
Both	16	13.44563	5.608466	1.402117

$t(14) = -1.66$, $p = 0.12$[7]

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[6] The number of observations is lower in this instance because there was not comparable price level data for every country available from the same source.

[7] The number of observations is lower because there was not comparable price level data for every country available from the same source.

Table 4: Comparison of unadjusted reservation wage using two tailed t-test

Variable	Count	Mean (in €)	Std. Dev.	Std. Err. of Mean
Unadj. reservation wage$_{NC}$	9	17.87128	22.80890	7.602966
Unadj. reservation wage$_{SC}$	12	11.99917	4.690280	1.353967
Both	16	13.44563	5.608466	1.402117

$t(19) = -0.88, p = 0.39.$

In terms of performance, the group with no control improved by a mean of 45.17 points (SD = 18.94, N = 12) from their initial proficiency rating SP_i on a scale of 100. The group with some control improved by mean of 38.51 points (SD = 20.22, N = 12); again the difference between the two groups was not significant, $t(22) = 0.83$, $p > 0.10$. The Mann-Whitney test also reported no significant difference $U = 0.49$, $p > 0.10$.

The difference in time taken to complete the learning portion of the study between the two groups was not significant $t(16) = -0.35$, $p > 0.10$, the group with no control taking a mean of 36.22 minutes (N = 9, SD = 5.04) and the group with some control taking a mean of 38.89 (N = 9, SD = 5.8).[8] The Mann-Whitney test also reported no significant difference $U = 0.53$, $p > 0.60$.

The differences between the two groups was further investigated using OLS regression. From here on, only the adjusted willingness to pay values and reservation wages will be stated, as in theory they should be more accurate and in this study they returned better results. With respect to both willingness to pay and reservation wages, the initial proposed model returned results that were far from satisfactory. Both the R-squared and Adjusted R-squared values are very low and none of the choice variables effect on Adjusted WTP is significant (see Table 5). These variables were then tested with redundant variables tests and omitted variables tests that included the variables gathered in the study that had not previously been included in the model.

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[8] Some observations were dropped because these participants took breaks during the learning portion, some as long as ten hours.

Table 5: OLS regression — adjusted WTP as dependent variable (initial model)

Variable	Coefficient	Std. Error	Dependent variable: t-Statistic	Adj. WTP Prob.
(EP-SP)	0.063789	0.185273	0.344297	0.7366
perceived control	0.382706	1.405149	0.272360	0.7900
learner enjoyment	0.465262	1.564781	0.297334	0.7713
financial background	-1.000832	5.003359	-0.200032	0.8448
learner effort	-0.768160	2.169565	-0.354062	0.7294
academic ability	3.409683	3.241099	1.052014	0.3135
R-squared	0.082752		Adjusted R-squared	-0.299434

The variables *(EP-SP), learner enjoyment, financial background, learner effort* and *academic ability* were all found to be redundant. The dummy variables for *USA*, and for *practice* were found to be relevant and were included. A new model was found to be a better fit:

$$\text{Adj. willingness to pay}_i = \beta_0 + \beta_1 Control_i + \beta_2 USA_i + \beta_3 Practice_i + \varepsilon_i$$

In this new model, both treatment group and perceived control, used as *Control$_i$*, indicated that more control had a positive effect on willingness to pay. However, when using the treatment group, both the R-squared and Adjusted R-squared values were very low, -0.10 and -0.24 respectively, so this result has been discarded. Focusing on using perceived control as the measure of control, the results from this model are displayed below:

Table 6: OLS regression — adjusted WTP as dependent variable (updated model)

Variable	Coefficient	Std. Error	Dependent variable: t-Statistic	Adj. WTP Prob.
(Perceived) Control	1.759397	0.387037	4.545809	0.0004
USA	20.10658	5.626945	3.573268	0.0028
practice	-6.641369	4.764273	-1.393994	0.1836
R-squared	0.421511		Adjusted R-squared	0.344380

18 observations, Durbin-Watson stat = 1.22, Jarque-Bera = 0.14, p > 0.10

Perceived control was found to have a positive effect on willingness to pay at the 1% significance level (Table 6). Being from the USA also had a positive effect, but at the 5% significance level. This model has been tested for robustness, using various statistical tests. No heteroskedasticity or autocorrelation was found at the 10% significance level and the Jarque-Bera test did not indicate that the residuals were not normally distributed, at the 10% significance level. The un-centred variance inflation factor was less than 5 for all the variables, indicating the absence of multicollinearity. The R-squared and Adjusted R-Squared values are reasonable (0.42 and 0.34 respectively).

It is not clear why being from the USA has an effect on the willingness to pay; it may simply be a result of having such a small sample size. Nonetheless, the model was investigated after removing US participants from the sample and the results were similar (see Table 7).

Table 7: OLS regression — adjusted WTP as dependent variable, excluding US participants from the sample

			Dependent variable:	Adj. WTP
Variable	Coefficient	Std. Error	t-Statistic	Prob.
(Perceived) Control	1.803402	0.310593	5.806310	0.0001
practice	-6.216436	4.123413	-1.507595	0.1575
R-squared	0.223942		Adjusted R-squared	0.159270

14 observations, Durbin-Watson stat = 0.57, Jarque-Bera = 0.69, p > 0.10

The initially proposed model also fared very badly when looking at the effect of control on reservation wages. None of the choice variables had a significant effect, and the R-squared and Adjusted R-squared were -0.11 and -0.66 respectively. The model was re-specified, with different variables included and omitted and a new model was found to be a better fit:

$$reservation\ wage_i = \beta_0 + \beta_1 Age_i + \beta_2 Desire\ Chess_i + \beta_3 Student\ Level_i + \beta_4 Control_i + \beta_5 Education\ Level_i + \beta_6 Female_i + \beta_7 Self\text{-}Preference_i + \varepsilon_i$$

Using this model, all the choice variables, with the exception of a preference for self-guided tuition, were shown to have an effect at the 10% significance level. The effect of a preference for self-guided tuition was not significant. Age and education level had a positive effect on the reservation wage, which is to be expected. Being female also had a positive effect on the reservation wage. A desire to learn chess, and being more academically able, both had negative effect on the reservation wage. The former can be explained by the participant actually wanting to play as much chess as possible, and thus being willing to accept less money to do so. The latter result appears counterintuitive. Being in the group with control had a negative on the willingness to pay. This is also unexpected and could have been caused by various things. The possibilities are discussed in section 6. The results of this model are displayed in the Table 8.

Table 8: OLS regression — adjusted reservation wage as dependent variable (updated model)

Variable	Coefficient	Std. Error	Dependent variable: t-Statistic	*Adj. reservation wage* Prob.
control (by group)	-4.516629	2.258840	-1.999535	0.0766
desire chess	-11.91997	4.885885	-2.439675	0.0374
student level	-5.572946	2.186335	-2.548990	0.0312
education level	2.560709	1.183095	2.164414	0.0586
female	7.557758	3.590825	2.104741	0.0646
self-preference	3.930531	2.777080	1.415346	0.1906
age	0.749911	0.263984	2.840742	0.0194
R-squared	0.652333	Adjusted R-squared		0.420556

16 observations, Durbin-Watson stat = 2.58, Jarque-Bera = 6.15, p > 0.05

This model has also been checked for robustness using all the standard statistical tests. The variance inflation factors for age, student level and education level were 39.97, 51.67, and 20.43 respectively. This indicates that there is some correlation between these variables, however the focus is on control, so this is acceptable.

When perceived control was included in the model it was found not to have a significant effect, so it was dropped.

Two additional regressions were done to investigate the effect of control on proficiency. When looking at improvement, EP_i - SP_i, both perceived control and control group were found to have a significant effect at the 5% level, however, they were of conflicting directions (see Table 9).

Perceived control indicated that more control had a positive effect on score improvement, whereas being in the group with some control had a negative effect on score improvement. This may indicate design flaws in the experiment. This is discussed in detail in section 6. *Education level$_i$*; the highest level of schooling that participants had completed, was seen to have a negative effect. Age was seen to have a positive effect, as was being female. These effects were all significant at the 5% level, except for treatment group, which was significant at the 10% level.

Table 9: OLS regression — EP_i - SP_i as dependent variable

Variable	Coefficient	Std. Error	Dependent variable: t-Statistic	EP_i - SP_i Prob.
(Perceived) Control	3.066241	1.161801	2.639213	0.0162
Education Level	-6.320918	2.963694	-2.132783	0.0462
Control (By Group)	-10.98058	5.938617	-1.849014	0.0801
Age	1.448745	0.491085	2.950091	0.0082
Female	21.93507	5.938058	3.693981	0.0015
R-squared	0.598309		Adjusted R-squared	0.513742

24 observations, Durbin-Watson stat = 2.03, Jarque-Bera = 1.17, p > 0.10

In contrast, when looking solely at EP_i; how the participants scored in the learning assessment, only education level and perceived control had a significant effect. The sign of this effect changed for perceived control to positive, however both the coefficients were very small; less than 0.10, and the Adjusted R-Squared for this regression was -0.15, indicating that this particular model does very little to explain the variation in willingness to pay.

6. Discussion

The small sample size of the experiment in this study is the likely cause of the apparently conflicting nature of the results. At a glance, the first tests indicate that there was no significant difference between the two treatment conditions for either of the dependent variables, willingness to pay and reservation wage. Yet when using OLS regression, perceived control has a positive effect on willingness to pay that is significant at the 1% level, whereas the effect of treatment group is not significant. Looking at reservation wages, the opposite is true; treatment group has an effect, but perceived control does not. This conflict is even more apparent when looking at regression against score improvement; both perceived control and treatment group are significant at the 10% level, but in opposite directions — a greater sense of perceived control means a greater improvement but being in the group with some control means less improvement. This conflict suggests that how much control participants felt they had is at odds with how much the treatment group dictated they had. Clearly, there was not enough distinction between the group with no control and the group with some control — at least the participants could not have perceived it as so.

It would have been ideal to have more variation between the two treatment conditions, yet this would have been difficult to do, considering the type of website that would have needed to have been constructed. An alternative would have been to have conducted the experiment in a controlled classroom setting, using textbooks and other materials. However such an approach would have created problems of its own. The presence of a teacher alone, would introduce some sort of bias. Additionally, organising the class itself would have been difficult, and the prospect of having the participation online, in theory, has potential for more participants. An online experiment is open to anyone with an internet connection, whereas an experiment in the classroom would only be open to people within the locality.

The sample size was also hindered by the lack of appropriate incentives. It took participants over half an hour to complete the learning portion of this study. Along with the preliminary questions, instructions they had to read and the follow-up questionnaire, it took participants up to an hour to complete the experiment. They

were offered the opportunity to win an iTunes gift voucher in exchange for their participation but as this was only an opportunity to win in a prize draw, the expected value of the remuneration for participating in this study was very low. Essentially, the main incentives that participants had, were to learn how to play chess, and to aid a student in his thesis research. If this study were to be conducted again, in an ideal setting, sufficient remuneration would be needed in order to acquire enough participants to make the results widely applicable.

This issue of incentive is also likely to have affected the willingness to pay. If the participant does not have a desire to learn chess, then they are not going to be willing to pay much for it. Provided with an imaginary scenario, as they were in the experiment, it is possible they may just pick a random number, rather than provide their true valuation. The dummy variable for desire to play chess did not have a significant effect on willingness to pay in any of the models and this suggests that the results of the experiment may not be representative.

Additionally, the variables collected could be improved upon. One such instance of this, is in how data about the financial background of the participant was collected. Participants were asked to select which after tax income bracket they fell under from four different bands. However, when asked their reservation wage, they were asked to state it in an hourly wage. It would have been better to have these two variables in a comparable amount. This would have given insight into whether participants were stating wages similar to, above or below what they currently earned. Additionally, participants were asked their willingness to pay prior to the learning portion of the study, as well as also being asked their willingness to pay afterwards. Of the 24 participants that completed the study, 20 participants stated the same value after the learning portion as they did before it. This suggests that their preconceived idea of how much a class should cost was influential in determining their willingness to pay, rather than the amount of control that they had. There was no significant difference between the two groups in this respect, however.

It may have also been better to select the sample from a less varied population. Indeed, the variation makes the experiment more widely applicable, but in this case it

also introduces more factors that could affect the treatment variables. For example, the issue of relative price levels and different wage levels in the different countries. Price levels are aggregate measures and don't correct for every basket of goods; they are often devised using a select basket of goods, one that usually doesn't include learning how to play chess online. Thus it is unknown how such a product may be valued and priced differently in different countries. The individuals of these countries would of course have different ideas about how much such a product should cost. Choosing participants from one country would eliminate this issue.

When looking at the two groups as a whole, there was no significant difference between any of the dependent variables measured; willingness to pay, reservation wage, time taken to complete the learning portion, and improvement from initial starting point. Significant effects were apparent, however, when doing the regressions. Firstly, looking at perceived control, it had a positive effect on willingness to pay. This supports the proposed hypothesis. However, the fact that the other variables proposed in the initial model were redundant, proves troublesome. Some of these variables, such as effort, have previously been proven to have a positive effect on valuation; why was that not present here? It may indeed be possible that the proposed value increment simply does not exist when applied to education. As it was not present as a result of increased effort, then it may not be present under any circumstances. However, it is beyond the scope of this study to make such a conclusion. Before investigating whether learner control can trigger a value increment, more research should be done into whether a value increment can be triggered in education under any similar circumstances; increases in effort would be a sensible starting point.

The dummy variable USA had a significant effect in the regression and when participants from the USA were removed from the analysis, the resulting R-squared values were much lower. This is an unforeseen result. It may suggest that Americans value the game of chess more, or it may suggest they are generally willing to pay more to learn. The latter could be explained by the high costs of education in the United States, when compared to Europe. It may also be because of the small

sample size. It's impossible to know the reason for this effect from this experiment alone.

When looking at the adjusted reservation wage, age and education level had a positive effect; the older and more highly educated the participant, the higher wage they would require to do the chess related task. This was to be expected. Being female, however, also had a positive effect on the reservation wage. It is not clear why this is. The variance inflation factor for this variable is not high. Indeed, the later regressions showed that being female also had a positive effect on score improvement, however as score improvement did not have a significant effect on reservation wage, this knowledge doesn't make it any clearer as to why being female did. It is possible that with a larger sample this effect would not be present.

Control, as defined by group, was seen to have a negative effect on reservation wage, whereas perceived control's effect was insignificant. This discrepancy may be because there were differences between the two groups unrelated to control that were not captured by any other of the choice variables. This is only speculative, however, and with the current data, there is no way to tell.

Analysing the results of the experiment also brings to light another issue with the variables; reservation wage is only a proxy for how much a person values themselves in the labour market. There are other factors that can cause an individual to raise or lower their reservation wage, such as enjoyment of their job and convenience of the job. Some people may be willing to be paid less because they enjoy doing something, whereas others may not. Using reservation wage as a proxy for value would suggest that these individuals value their labour differently, when that may not actually be the case. It may just be that the former accepts enjoyment as compensation, rather than money.

7. Conclusion

The results of this study are conflicting. Perceived control had an effect on willingness to pay, but not on reservation wages. Control, defined by treatment group,

had an effect on reservation wages, but not on willingness to pay. The results also suggest that the treatment group is not well defined. If this is so, then even the relationship with reservation wages and the absence of one with willingness to pay may be inaccurate. Furthermore, variables which have previously been shown by literature to have an affect on willingness to pay did not have an effect here. This suggests that the results could be inaccurate, or possibly that no such relationship between those variables and willingness to pay exists when applied to education. It is not possible to know which from the results of this experiment.

The inconclusive nature of these results suggests that this relationship is something that should be further investigated; perhaps beginning with an investigation into whether effort justification applies to an intangible such as education. If this study were to be conducted again, it is important that sufficient incentives are provided in order to obtain enough participants to make the results applicable. Indeed, in this experiment, a request to participate was sent to over 2000 people, however only 58 responded, with only 24 actually completing the experiment. The small sample size means that the results cannot be widely applicable. With different incentives, there may have been a completely different outcome.

With respect to design of the experiment; in a repeated experiment, one could try to find a different proxy for how much someone values themselves as a labourer, or find a way to correct for other variables that may affect an individual's reservation wage. The distinction between the two groups would also have to be much greater. The literature explains the value increment of self-designed products by attributing it to a better preference fit, and enjoyment of the design process itself. In this study, participants did not really enjoy a design process. Perhaps it was not clear enough that they were in control of what they learned. As a lot of the variables involved are psychological, in future experiments it is important that the participants are *aware* of their input as designers of their learning process. The customisation needs to be a conscious effort, rather than something passive that they are made aware of after the fact. Bearing these considerations in mind, this paper suggests that a relationship between learner control, willingness to pay and reservation wages is something that deserves more investigation.

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Appendix I.

The materials presented to the participants during the learning portion of the experiment can be viewed at the following links:

Group with no control:http://users16.jabry.com/gic13kok/learning_portion1.html

Group with some control: http://users16.jabry.com/gic13kok/index2_1.html

The webpages will remain up until November 1st 2014. The content of the webpages was written by myself, using readily available information from wikipedia, chess.com and other chess related sites listed in the references.

Appendix II. (Information & Consent Form)

Dear participant,

Your participation number is: [Participant Number]

Please make a note of this as you will be required to enter it at various times during the study. We use a participation number to give participants anonymity and once you have been emailed your score in the learning assessment your email address will be removed from all of your responses.

Below is all the information you need to begin the study. Please read it carefully before you begin. If you would like to be entered into the iTunes voucher prize draw, you will be prompted to submit your email address once you have completed the study. Please complete this study only once.

Information & Consent

Date: 6th September 2014

Study Title:

Learner Control, WTP & Subsequent Reservation Wages

Researcher:

Kenechi Okolo, MSc candidate, Masters Programme in Economics, Lund Universitet

Purpose of the Research:

To investigate the relationship between learner control, willingness-to-pay and subsequent reservation wages. As part of my MSc research I am looking at how varying levels of a learner's control in the method and content of their learning affects their subsequent valuation of the learning itself and of themselves as an individual with newly acquired skills.

What You Will Be Asked to Do in the Research:

This study consists of two portions, a learning portion and an assessment portion. The whole study should take about 30 - 60 minutes to complete. This time may vary however, depending on how quickly you choose to move the learning material and your rate of the responses during the learning assessment portion. During the learning portion you will be directed to a website where you will be shown information about the basic rules and features of the game of chess. The information should be sufficient enough for you to learn how to play at a novice level, or serve as a reminder for you if you already have some knowledge of the game. Please note that as this study investigates learning, if you already know how to play chess and you play frequently or have played very recently, then you should not participate in this study. Once you have had time to learn all of this information and the opportunity to have some practice you will move on to the learning assessment portion of this study. You will be directed to another webpage to complete this portion. This portion consists of a quiz to test the amount of information you have retained, and a follow-up questionnaire to gain some information about you (to control for any factors that may bias the results, such as gender & age) and to elicit some information about your feelings regarding the learning portion.

The results from the learning assessment and follow-up questionnaire will be grouped and collectively analysed, and then published within the subsequent master thesis. If you would like a copy of the final thesis and/or a look at the results of the study, you will have the opportunity to indicate this during the follow-up questionnaire.

What You Will Get for Taking Part in the Research:
All participants will be entered into a prize draw to win a 300 SEK (or the equivalent) iTunes gift voucher. All participants are of course entitled to a copy of the final thesis and results of the study.

Risks and Discomforts:
I do not foresee any risks or discomfort from your participation in the research.

Voluntary Participation:

Your participation in the study is completely voluntary and you may refuse to answer any question or choose to stop participating at any time. Your decision not to volunteer will not influence the nature of your relationship with Lund Universitet either now, or in the future.

Withdrawal from the Study:

You can stop participating in the study at any time, for any reason, if you so decide. Your decision to stop participating, or to refuse to answer particular questions, will not affect your relationship with the researcher or Lund Universitet. Should you decide to withdraw

from the study, all data generated as a consequence of your participation will be destroyed.

Confidentiality:

All information you supply during the research will be held in confidence and your name will not appear in any report or publication of the research. Your email address will be required to send you your score for the Learning Assessment portion of this study, but once this information has been sent, it will be deleted and there will be no identifying information associated with your participation in this study. Your data will be stored securely and only the researcher will have access to this information. Confidentiality will be provided to the fullest extent possible by law.

Questions about the Research:

If you have questions about the research in general or about your role in the study, please feel free to contact the researcher Kenechi Okolo by e-mail gic13kok@student.lu.se.

Legal Rights and Signatures:

I consent to participate in *Learner Control, WTP & Subsequent Reservation Wages* conducted by *Kenechi Okolo*. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by doing so. By clicking on the following link I indicate that I have given my consent and that I wish to begin my participation in the study.

Note: Participation in this study will be closed at 12:00 (GMT) on Sunday 20th September 2014. All participation after this time cannot be counted. I ask that you complete the study before this time. Thanks!

[Begin Study](#)

Thank you for agreeing to take part in this study. Your participation is very greatly appreciated. And remember, if for any reason you would like to withdraw from the study, you are free to do so at any time, with no repercussions to you.

Kind regards,

Kenechi Okolo

Appendix III.

Preliminary Questions

Below are some questions to assess your existing knowledge about chess. For any question that you do not know the answer to, simply select 'Don't know' as your response. As this is just a preliminary test, don't spend too much time on it. It shouldn't take you up to 5 minutes. Make sure you click on submit when you have entered all your responses!

* Required

1. **Please enter your participant number in the box below. ***

   ....

2. **When was the last time you played chess? ***

   Mark only one oval.

   - ◯ This week
   - ◯ This month
   - ◯ This year
   - ◯ In the last five years
   - ◯ More than five years ago
   - ◯ I have never played chess before

Puzzle 1

1. White to Move & Mate in 1
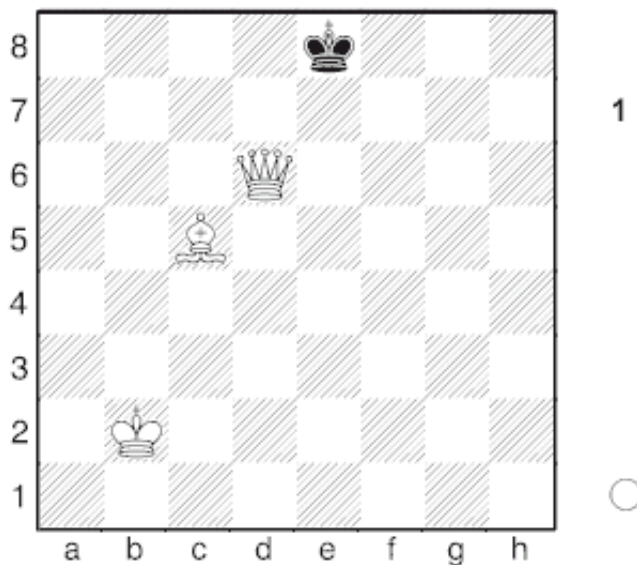
3. **Please look at the image above, titled Puzzle 1. It is White's turn to move. Of the options below, please select which would result in a checkmate.** *

Mark only one oval.

( ) Don't know

( ) White Queen to square g6

( ) White Queen to square e6

( ) White Queen to square b8

( ) White Queen to square e7

4. **In a game of chess, which colour moves first?** *

Mark only one oval.

( ) Black

( ) Don't know

( ) White

5. **Which piece can move only in a forwards direction?** *

Mark only one oval.

( ) Bishop

( ) Queen

( ) Pawn

( ) King

( ) Don't know

6. **Imagine that the learning portion of this study that you are about to participate in is to be developed into an introductory class in a series of 10 to learn how to play chess from novice to advanced level. Imagine that there are limited places in this class and that an auction is to be held to determine who can participate. Each individual is to make a bid for a single class and from the bids of all the participants one will be chosen at random. If your bid equals or is greater than the randomly chosen bid then you would be guaranteed a place in all 10 classes for the price that you had bid. All participants who had bids lower than the randomly chosen bid would be excluded from the class. In this scenario, what is the maximum amount that you would be willing to bid for a single class? ***

Please give an amount no less than €3 (or equivalent) and no greater than €30 (or equivalent), or state that you would not be willing to make a bid of any amount. Feel free to state the amount in the currency that you are most familiar with.

Appendix IV.

Learning Assessment

This is the Learning Assessment portion of this study. Below are some questions regarding the information that you have just learned. Please answer all questions to the best of your ability. Your email address is required to send you your score for this assessment and will be deleted from the results of this form once your participation in this study has been completed. It will only be kept for future correspondence should you request this. This assessment should take less than 10 minutes.

* Required

1. **Please enter your email address in the box below. ***

   ....

2. **Please enter your participant number in the box below. ***

   ....

3. **This assessment consists of questions about the basics of chess, all of which were covered in the learning portion of this study. Consequently, both participants in this study and people with knowledge about the game of chess should be able to score highly. Please give an indication below of how highly you think you may score. ***
   Mark only one oval.

   ( ) Lower than 25%

   ( ) 25% to 50%

   ( ) 51% to 75%

   ( ) Greater than 75%

4. **Of the following options, please check ALL that apply ***
   Check all that apply.

   [ ] I am not confident that I can play chess

   [ ] I am confident that I know enough to play

   [ ] I am confident that I know enough to play and to possibly beat other opponents

   [ ] If I were to play against another participant of this study (all participants are beginners like yourself) I think that I am more likely to win than lose

5. **In a game of chess, which colour moves first?** *

Mark only one oval.

- ( ) Black
- ( ) White
- ( ) Don't know

6. **How many pieces does each player have at the start of a chess game?** *

Mark only one oval.

- ( ) 12
- ( ) 6
- ( ) 18
- ( ) 16
- ( ) Don't know

7. **Which piece can move only in a forward direction?** *

Mark only one oval.

- ( ) Queen
- ( ) Bishop
- ( ) King
- ( ) Pawn
- ( ) Don't know

8. **Which piece can move only diagonally?** *

Mark only one oval.

- ( ) Queen
- ( ) Bishop
- ( ) Rook
- ( ) King
- ( ) Don't know

9. **Which piece moves in an L shape?** *

Mark only one oval.

- ( ) Bishop
- ( ) King
- ( ) Rook
- ( ) Knight
- ( ) Don't know

10. **Under normal circumstances, how many squares can the King move each turn? ***

Mark only one oval.

- ◯ 2
- ◯ 1
- ◯ Unlimited
- ◯ Don't know

11. **Which piece can move any number of unoccupied squares in a straight line only horizontally or vertically? ***

Mark only one oval.

- ◯ Queen
- ◯ King
- ◯ Knight
- ◯ Rook
- ◯ Don't know

12. **Which piece can move any number of unoccupied squares in a straight line horizontally, vertically AND diagonally? ***

Mark only one oval.

- ◯ Queen
- ◯ Bishop
- ◯ Rook
- ◯ King
- ◯ Don't know

13. **In the most common method of assigning relative values to pieces, please indicated how many points a Rook is worth. ***

Mark only one oval.

1	2	3	4	5	6	7	8	9	10
◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

14. **In the most common method of assigning relative values to pieces, please indicated how many points a Queen is worth. ***

Mark only one oval.

1	2	3	4	5	6	7	8	9	10
◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

15. **In the most common method of assigning relative values to pieces, please indicated how many points a Knight is worth. ***

Mark only one oval.

1	2	3	4	5	6	7	8	9	10
◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

16. **In the most common method of assigning relative values to pieces, please indicated how many points a Pawn is worth. ***

Mark only one oval.

1	2	3	4	5	6	7	8	9	10
◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

17. **Of the following statements, please mark ALL that are TRUE ***

Check all that apply.

☐ Stalemate occurs when there are not enough pieces on the board to force a checkmate

☐ Stalemate occurs when a player's King is NOT in check, but the player cannot make any legal moves

☐ A draw occurs when 50 moves have been made with no piece being captured and no pawn having been moved

18. **Of the following statements, please mark ALL that are TRUE. ***

Check all that apply.

☐ Promotion occurs when a pawn reaches the end of the board

☐ A promoted pawn can become any other piece the player chooses, except for the King

☐ Only the first pawn that reaches the end of the board can be promoted

☐ Pawns cannot be promoted into a Queen if another Queen of the same colour already exists on the board

19. **Of the following statements, please mark ALL that are TRUE. ***

Check all that apply.

☐ When castling, it must be the King's first move

☐ When castling, it must be the Rook's first move

☐ Castling can be used to move the King out of check

☐ The King can move two squares when castling

☐ Castling can only be done with the Rook that is closer to the King

20. **Of the following statements, please mark ALL that are TRUE** *

Check all that apply.

- [ ] Chess is a turn based game
- [ ] The objective of chess is to capture the opponent's King
- [ ] Pieces are captured when opposing pieces land on the same square
- [ ] Check is when a player's King is under threat of capture on their opponent's next turn
- [ ] Checkmate is when a player's King is in check and there is no way to remove the threat

Appendix V.

Follow-up Questionnaire

This is the follow up questionnaire to the Learning Assessment portion of this study. Your responses to this questionnaire are an integral part of this study, and will directly determine the dependent variable (the variable of interest), however, if you are uncomfortable answering any of the questions here, feel free to leave responses blank. Please do not complete this questionnaire until you have received your score for the Learning Assessment. It is also important that you only complete this questionnaire once. This questionnaire should take no more than 10 minutes to complete. Thank you for your cooperation.

* Required

1. **Please enter your participant number** *

   ....

2. **Please enter your score for the Learning Assessment** *

   ....

3. **What is your gender?** *
   Mark only one oval.

   ( ) Male

   ( ) Female

4. **Please enter your age.** *

   ....

5. **Which income bracket do you fall under?**
   Stated values are after tax is deducted. Sample exchange rates: €1 = 9.2 SEK = £0.80 = $1.30
   Mark only one oval.

   ( ) Less than €12 000 (or equivalent)

   ( ) €12,001 to €36 000 (or equivalent)

   ( ) €36 001 to €60 001 (or equivalent)

   ( ) More than €60 001 (or equivalent)

6. **In which country do you normally reside?** *

   ....

7. **Which currency are you most accustomed to using?** *

....

8. **What is the highest level of education you have completed?**
Mark only one oval.

- ◯ Elementary / Primary School
- ◯ Middle School / Secondary School
- ◯ High School / A Levels
- ◯ Bachelor's Degree
- ◯ Master's Degree
- ◯ Phd or any other advanced qualification

9. **In your previous experiences with education, how would you rank your grades in comparison to other students in your class?**
Mark only one oval.

- ◯ Far below average
- ◯ Below average
- ◯ Average
- ◯ Above average
- ◯ Far above average

10. **Do you enjoy learning in general?**
Mark only one oval.

- ◯ Yes
- ◯ No

11. **Which do you prefer?**
Mark only one oval.

- ◯ Learning by yourself.
- ◯ Being taught directly.

12. **Do you have any experience with alternative education, such as home schooling, montessori, discovery learning etc. (if yes, please specify)**
Mark only one oval.

- ◯ Yes
- ◯ No

13. **How often do you use the internet to search for information?**
Mark only one oval.

○ More than once a day

○ Daily

○ A few times a week

○ Once a week

○ A few times a month

○ Once a month

○ Almost never

14. **Are you confident you now know the basic rules of chess?** *
Mark only one oval.

○ Yes

○ No

15. **Are you confident you can now play chess at a beginner's level?** *
Mark only one oval.

○ Yes

○ No

16. **On a scale of 1 to 10, with 1 representing not enjoyable at all, and 10 representing extremely enjoyable, how much did you enjoy the learning portion of this study?** *
Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Not enjoyable	○	○	○	○	○	○	○	○	○	○	Extremely enjoyable

17. **On an increasing scale of 1 to 10, how much effort do you feel that you exerted during the learning process of this study?** *
Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Minimal effort.	○	○	○	○	○	○	○	○	○	○	An intense level of effort.

18. **On a scale of 1 to 10, with 1 being absolutely no control, and 10 being complete control, how much control do you feel you had over what you learned in this study?** *

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
No control.	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	Complete control.

19. **During the learning procedure of this experiment, did you make use of the internet?** *

Mark only one oval.

◯ Yes

◯ No

20. **If you answered yes to the previous question please specify what you used the internet for (e.g. searched for better explanations of a concept)**

....

....

....

....

....

21. **During the learning procedure of this experiment, did you make use of any other resources?** *

Mark only one oval.

◯ Yes

◯ No

22. **If you answered yes to the previous question please specify which resources you used and what you used them for.**

....

....

....

....

....

23. **At any point in this study, have you taken a break of 10 minutes or longer?** *

Mark only one oval.

◯ Yes

◯ No

24. **If you answered yes to the previous question, please indicate approximately how long the break you took was.**

    ....

25. **Please tick ONLY ONE of the following boxes**
    Check all that apply.

    ☐ I am participating in this study because of my desire to learn how to play chess.

    ☐ I am participating in this study because of my desire to improve my chess playing ability.

    ☐ I am participating in this study for other reasons.

26. **After the learning portion, did you use the embedded chessboard to practice playing? ***
    Mark only one oval.

    ◯ Yes

    ◯ No

27.

    ....

28. **Do you consider yourself frugal or careful with money? ***
    Mark only one oval.

    ◯ Yes

    ◯ No

29. **Imagine that the learning portion of this study is to be developed into an introductory class in a series of 10 to learn how to play chess from novice to advanced level. Imagine that there are limited places in this class and that an auction is to be held to determine who can participate. Each individual is to make a bid for a single class and from the bids of all the participants one will be chosen at random. If your bid equals or is greater than the randomly chosen bid then you would be guaranteed a place in all 10 classes for the price that you had bid. All participants who had bids lower than the randomly chosen bid would be excluded from the class. In this scenario, what is the maximum amount that you would be willing to bid for a single class? ***

Please give an amount no less than €3 (or equivalent) and no greater than €30 (or equivalent), or state that you would not be willing to make a bid of any amount. Feel free to state the amount in the currency that you are most familiar with. You are also free to state a different amount (higher or lower) to the amount you stated in the preliminary questions.

30. **Imagine that the learning portion of this study is to be developed into an introductory class in a series of 10 to learn how to play chess from novice to advanced level. Imagine that there are limited places in this class and that an auction is to be held to determine who can participate. Each individual is to make a bid for a single class and from the bids of all the participants one will be chosen at random. If your bid equals or is greater than the randomly chosen bid then you would be guaranteed a place in all 10 classes for the price that you had bid. All participants who had bids lower than the randomly chosen bid would be excluded from the class. In this scenario, what is the maximum amount you think that other people would be willing to bid for a single class? ***

Please give an amount no less than €3 (or equivalent) and no greater than €30 (or equivalent), or state that you do not think other people would be willing to make a bid of any amount. Feel free to state the amount in the currency that you are most familiar with.

31. **Imagine that the researchers of this study are currently developing an online chess game. We have designed the algorithms that guide the computer's play, but in order to test their effectiveness we need human players to play games of chess against the computer. In such a scenario, a human player might be required to repeat the same sequence of moves several times in succession and thus the work would be tedious and sometimes boring. Each human tester would be required to log 40 hours of work. Please state the hourly wage you would like to be paid in order to do such a task (or indicate that you would not be willing to do such a task, or that you would do it for free).** *

Please make sure to indicate which currency your chosen amount is in.

....

32. **In this study, participants were assigned to one of two groups. In one group participants had no control over what was covered in the learning portion and in the other group, participants had some control - the latter group choose the topics they looked at and were able to skip some. If you were to learn something new in a method similar to the one used in this study, which group would you prefer to be in?** *

Mark only one oval.

( ) The group with no control

( ) The group with some control