# Investigating How Social Elements Affect Learners with Different Personalities

Wad Ghaban, Robert Hendley and Rowanne Fleck

*School of Computer Science, University of Birmingham, B15 2TT, U.K.*

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Abstract:     Social presence is an essential factor in preventing learners from feeling isolation in online courses and in keeping them connected. Some studies, however, point to the negative impact of the social elements in distracting learners from concentrating on a course's content. In this study, we investigated the influence on learners of different personality types (using the big five model) of an optional chat added to an online learning platform. The results show that there is a variation in the response of the learners based on their personality. However, some personality classes spent the majority of time in the chat discussing off-topic subjects, such as fashion or travel. Thus, although they enjoyed the features in the system, it negatively affected their knowledge gain. We discuss the implications of our findings for adaptive online learning platforms in catering to learners with diverse personalities.

## 1 INTRODUCTION

A social presence in online learning courses is becoming very important; it prevents learners from feeling isolated and makes them feel that they belong to the course and are connected to other learners (Means et al., 2009). However, some researchers have claimed that learners have different responses to social elements. Some learners find these elements enjoyable and motivational (Kehrwald, 2008). Other researchers argue that social elements are uninteresting and cannot represent real human interaction (Cobb, 2009). Because of this difference in the perception of social elements in online courses, we aimed to understand how different learners perceive social elements. In this research, we used personality as a stable characteristic that can be used to describe human behaviour (Hogan and Hogan, 1989). Although many personality theories can be considered to understand the effect of social elements, we adopted the Big Five personality traits, a commonly used theory to define personality. The Big Five personality traits classifies personality into five dimensions: conscientiousness, extraversion, agreeableness, neuroticism and openness to experience (Hofstee, 1994), and different characteristics are associated with each type of personality.

To understand the effect of access to chat on different personalities, We asked two groups of learners to use one of two versions of a learning website, either one that included chat or one that did not. Then, we analysed the number and the type of messages from learners with different personalities.

We hypothesised that learners with different personalities would have varied responses to access to chat in online learning courses. Highly extroverted and highly agreeable learners are usually described as social, and they like to compete and collaborate with others (Hofstee, 1994). Therefore, we hypothesised that these learners would send a high number of messages, which may enhance their knowledge gain and satisfaction. Highly conscientious learners are described as always being organised and self-triggered to complete their tasks (Hofstee, 1994). For these learners, we hypothesised that these learners will use the chat in appropriate way. These learners would report the same level of knowledge gain and satisfaction for both versions. Further, highly neurotic learners are described as having high emotional instability. Because of this, we hypothesised that these learners might not be satisfied with the chat and have lower knowledge gain in the case of online learning courses that included chat (Judge et al., 1999).

The results confirmed our hypothesis that there is a variation in the response to the social elements from the different personalities. Some learners enjoyed using the chat to talk about many unrelated topics, which negatively affected their knowledge gain.

Other learners, such as the highly conscientious ones, used the chat in an appropriate way, which did not affect their knowledge gain.

This kind of research is important for understanding the effectiveness of online learning platforms. Learners' interactions with online learning platforms need to be observed and monitored by teachers. A good teacher will then direct the interactions in a way that ensures that every learner is enjoying and learning from them. This is what is expected from future technologies: looking to the learners' characteristics and then directing their interactions in an appropriate way that meets the learners' expectations. However, to achieve this, we need a strong understanding of the effect social components have on learners by looking to other factors, such as the learners' moods and their effective state.

## 2 BACKGROUND

Online learning was defined by (Richardson and Swan, 2003) as any course that offers an entire curriculum online and gives learners the ability to access the materials anytime from anywhere (Anderson, 2008). (Richardson and Swan, 2003) noted that in online learning, learners and teachers no longer have to meet physically in order to share knowledge. These courses are free from the constraint of time and space (Ally, 2004). However, learners in online courses lack face-to-face interaction and often miss the feeling of belonging to a class, which may result in feelings of isolation. Much research has suggested adding social components to prevent learners from feeling isolated and to keep them connected to one another (Means et al., 2009).

### 2.1 Social Presence

(Garrison, 2007) noted that three elements must be present for success in learning: teacher presence, cognitive presence and social presence.

Social presence in online courses can be defined as the degree to which participants in computer-mediated communication can effectively connect (Swan and Shih, 2005). (Tu and McIsaac, 2002) defined social presence as the degree to which participants are aware of others in real interaction.

(Lowenthal, 2010) categorised social presence into three categories: a) effective responses containing personal expressions of emotions and feelings, b) cohesion responses containing expressions related to building and supporting relationships, such as greetings and c) interactive responses containing agree-

ments and disagreements. (Richardson and Swan, 2003) found that learners usually begin interactions with a large number of cohesion responses. However, over time, the number of interactive responses increased.

(Tu and McIsaac, 2002) noted that social presence elements are an essential factor of learners' success in online courses. Social presence can occur in online courses in many forms, such as chats, discussion boards and emails (Aragon, 2003). Interactions between learners can contain texts, voice messages and emojis (DeSchryver et al., 2009). Research shows a strong correlation between a high social presence and the learners' outcomes (Richardson and Swan, 2003). (Swan and Shih, 2005) pointed out that learners who felt more comfortable using social elements scored higher in their perceived learning. (Swan and Shih, 2005) examined the effect of social elements on learners' satisfaction and achievement by asking 91 students to enroll in one of two versions of a course: one with social elements and the other without. At the end of the experiment, they measured how social the learners were (high, medium or low) using a special questionnaire. They also measured learners' outcomes and satisfaction levels. They found that learners who were more social were more satisfied and had better perceived outcomes. These results were supported by (Richardson and Swan, 2003), who indicated that the high use of social elements is a predictor for learners' satisfaction levels and outcomes. (McInnerney and Roberts, 2004) pointed out that these elements can prevent learners from feeling isolated.

(Tu and McIsaac, 2002) showed that learners in online courses need more information about other learners' profiles in order to have a more effective interaction. However, (Garrison, 2007) argued that some problematic issues exist pertaining to social elements in online courses, as text-based communication cannot replace face-to-face expression and body language. In addition, delayed responses from the learners may annoy some learners, whereas other learners may feel insecure about computer-to-computer interaction. (Swan and Shih, 2005) interviewed learners and asked them about their opinion of the social elements. Some learners described text communication as 'cold' and unlike physical interaction. Other learners stated that social elements motivate them to complete the course. However, other learners mentioned that social elements are not challenging or interesting. Therefore, (Cobb, 2009) explained that the responses of different learners towards social elements in online courses varied. Thus, it is essential to understand how learners with diverse personalities respond to social elements in online courses.

## 2.2 Personality

Personality can be described as a set of characteristics that describe how individuals think and feel (Hofstee, 1994). (Hogan and Hogan, 1989) stated that personality is consistent, and it may develop over time. There are different theories used to describe personality. For example, there are three common theories of personality: Eysenck's theory of personality, the Myers-Briggs Type Indicator and the Big Five personality traits (Claridge, 1977). In this research, the focus will be on the Big Five, which is widely used in similar research (Wiggins, 1996).

**Big Five Model.** This theory is one of the most popular theories used to explain and understand personality (Wiggins, 1996). This theory classifies learners' personalities into five dimensions (types): conscientiousness, extraversion, agreeableness, neuroticism, and openness to experience. Table 1 summarises the traits associated with each personality type.

**Big Five Model Measurements.** The most common measurements are the NEO Five-Factor Inventory (the NEO-FFI) and the Big Five Inventory (BFI). Many versions of the NEO-FFI have been developed. Some of these versions have 240 questions, making them time-consuming to complete (Laidra et al., 2007). Thus, new short versions have been proposed. However, these shorter versions suffer from reliability problems. As a result, many researchers use the BFI, which is considered more reliable than the NEO-FFI. In addition, the BFI is free to use, and it exists in several languages. Some versions are designed for children and others for parents. In this research, we used the BFI (46 questions) which was developed for children (McInnerney and Roberts, 2004).

Table 1: A Summary of the Big Five Personality Traits (adapted from (Wiggins, 1996)).

| Personality | Characteristics |
|---|---|
| conscientiousness (a strong sense of purpose and a high aspiration level) | Leadership skills, capability to make long-term plans and often has an organised support network |
| Extroverted (a preference for companionship and social simulation) | Has good social skills and numerous friendships, often participating in team sports and having club memberships |
| Agreeable (a willingness to defer to others during interpersonal conflicts) | Forgiving attitude and a belief in cooperation |
| Neurotic ( sadness, hopelessness and guilt) | Low self-esteem and irrational and perfectionistic beliefs |
| Openness to experiences (a need for variety, novelty and change) | Interested in different hobbies and knowledgeable about foreign cuisine |

## 3 METHOD

This study aims to investigate how different personalities interact with existing social components (chat) in online learning system. In addition, we aim to examine the effect of social interactions on learners with varying personalities regarding their knowledge gain and satisfaction.

**Setup.** We built an online learning system to teach Microsoft Excel. The course consisted of 15 lessons designed by the researchers, starting with simple topics, such as drawing tables and visualising graphs. From there, the course progressed to high-level topics, such as mathematical and logical functions. We built the website in two identical versions. One version included a social component (chat); the other lacked this component. In the version that included chat, learners could use a button labelled 'Talk to a friend'. When the learner clicked on this button, the chat form appeared (Figure 1 ). In this version, learners believed that they were talking to another learner, whilst, in fact, they were talking to a researcher who was following a predefined script. We used this technique in order to control the conversation and to ensure that each learner experienced the same conditions.

At the start, learners were required to set up a username and a password. Subsequently, learners were asked to supply demographic information, including their age and gender. Learners were then asked to fill in a BFI personality test. Finally, learners were asked to fill in a pre-test related to the course itself.



Figure 1: A Screenshot of the Website Showing the Chat.

**Participants.** Before running the experiment, we were granted ethical approval from four schools in Saudi Arabia. Then, we sent a consent form to learners' parents in which the school explained the purpose of the experiment and informed them that all the collected data would be anonymous and secure. The learners and their parents were made aware that the learners were free to dropout at any time.

After obtaining the consent forms, 194 learn-

ers (91 boys, 103 girls) participated in the experiment.

**The Classification of Personalities.** In this study, we were concerned with understanding how different personalities would deal with existing social components. Accordingly, after obtaining the personality score from the BFI personality test, we classified each personality type into high, medium and low. Figure 2 shows an example of the classification of the extraversion personality. The cut-off points were arbitrarily chosen. To perform the classification, we drew a histogram that shows the values of the personality dimension on the x-axis and the frequency of the learners with that personality type on the y-axis. Then, we classified learners lower than $\mu - \sigma$ as low. Learners were assigned values for a specific personality trait above $\mu + \sigma$.

In this study, we believe there will be a strong effect on learners with extreme personalities. Consequently, we only focus on the learners who are high and low on each extreme of the personality type.
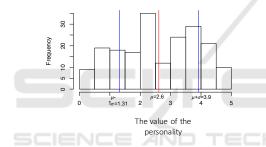


Figure 2: The Classification of the Extraversion Personality.

**Procedure.** After obtaining the consent form, we asked learners to fill in a demographic questionnaire, the BFI personality test and the pre-test. Then, learners were divided equally into two groups: one group used the website including the chat, and the other group used the version without the chat. The two groups were balanced in their age, gender, knowledge level and personality score. Next, we asked learners to use the website any time they liked; they were free to dropout at any time.

After six months, most of the learners had either dropped out or completed the course. Thus, after two months, we asked learners to fill in a post-test that related to the course and with the same number of questions as the pre-test. Then, we calculated their knowledge gain as:
Knowledge Gain = learners' post-test results - learners' pre-test results

We also asked learners to fill in a satisfaction questionnaire. To measure their satisfaction, we used the e-learner satisfaction tool (ELS) developed by Wang (Wang, 2003). This tool consists of several

components, including a system interface, learning content and system personalisation. The ELS tool comprises 13 questions with a seven-point Likert scale ranging from 'strongly disagree' to 'strongly agree'.

**Hypotheses.** In this study, we assume that there will be variation in the response of the learners towards the existing social elements. (Laidra et al., 2007) describe highly conscientious learners as always achieving well, and always making good progress. We hypothesise that learners with this personality will use the chat properly and that the conversation with the learners will be on topics related to the course, most of the time. These learners will always have high knowledge gain and high satisfaction, regardless of whether the system has social elements or not.

In contrast, highly extroverted learners, as described by (Laidra et al., 2007), are likely to enjoy making social relationships and interacting with others. Thus, these learners will use the chat frequently, and most of the messages will be off-topic. This may enhance their knowledge gain and satisfaction.

Highly agreeable learners are usually described as kind, and they like to collaborate with others. As a result, we hypothesise these learners will spend their time talking about the course and trying to help the ones with whom they interact. This may enhance their knowledge gain and their overall satisfaction.

## 4 RESULTS

In the study, we aimed to examine the influence of the presence chat on learners with different personalities. For that, we looked to the number of messages sent from each personality (table 2). There was a high number of messages sent from some personalities compared to other personalities. Thus, we believe it is interesting to find the kinds of messages received from learners and to find if the kind of messages has any effect on learners' knowledge gain and their satisfaction. Thus, we went to analyse the topic discussed in the messages.

### 4.1 Content Analysis

In this study, we received almost 7,000 messages in 50 days from different learners with different personalities. Hence, as a first step, we cleaned our data by removing all images and emojis. In the next step, each message was independently coded by 2 annotators, based on the message content. (We asked two native Arabic speakers to annotate each messages based

Table 2: The Number of Messages and the Number of Chats Opened for Learners with Different Personalities.

| Personality | Number of learners | Number of messages | Number of chats opened | Average (messages per chat) |
|---|---|---|---|---|
| High conscientious | 22 | 1,238 | 53 | 23.3 |
| Low conscientious | 18 | 1330 | 58 | 22.9 |
| High extraversion | 22 | 3,317 | 109 | 30.4 |
| Low extraversion | 25 | 343 | 26 | 13.19 |
| High agreeableness | 16 | 1,076 | 44 | 24.4 |
| Low agreeableness | 14 | 1305 | 36 | 36.25 |
| High neuroticism | 18 | 978 | 46 | 21.2 |
| Low neuroticism | 19 | 2486 | 94 | 26.44 |
| High openness | 21 | 1,749 | 70 | 24.9 |
| Low openness | 19 | 1654 | 55 | 30.7 |
| Total | 194 | 15476 | 591 | 26.1 |

Table 3: The Codebook Used to Define the Messages.

| Code | Definition | Example |
|---|---|---|
| T (Topic) | Messages relevant to the topic (Microsoft Excel) | Which operation has priority in the following formula in Excel: $3*2+1/4$ |
| O (Off-topic) | Messages related to any topic other than Microsoft Excel (e.g, fashion, travel, weather) | Who was the winner of the last football game between Al-Hilal and Al-Naser? |
| G (Greeting) | Messages representing all greetings, such as 'hello', or welcoming messages, such as' thank you'. | How are you? Where are you from? |
| GM (Gamifica-tion) | messages related to gamification, such as points and badges. | How many points and badges did you collect? |

Table 4: The Total Number of Messages (On-topic, Off-topic, Greeting and Gamification).

| Personality | | In-topic | Off-topic | Greeting | Game-fiction | Total |
|---|---|---|---|---|---|---|
| High conscientious | N | 300 | 574 | 321 | 43 | 1238 |
| | % | 24.2 | 46.3 | 25.9 | 3.6 | 100 |
| Low conscientious | N | 148 | 507 | 639 | 36 | 1330 |
| | % | 11.1 | 38.1 | 48.1 | 2.7 | 100 |
| High extraversion | N | 571 | 1612 | 864 | 270 | 3317 |
| | % | 17.2 | 48.5 | 26.02 | 8.1 | 100 |
| Low extraversion | N | 54 | 152 | 123 | 14 | 343 |
| | % | 15.7 | 44.32 | 35.8 | 4.08 | 100 |
| High agreeableness | N | 186 | 419 | 398 | 73 | 1076 |
| | % | 17.5 | 38.9 | 36.9 | 6.7 | 100 |
| Low agreeableness | N | 164 | 599 | 443 | 99 | 1305 |
| | % | 12.5 | 45.9 | 33.9 | 7.7 | 100 |
| High neuroticism | N | 98 | 414 | 433 | 33 | 978 |
| | % | 10 | 42.3 | 44.3 | 3.3 | 100 |
| Low neuroticism | N | 454 | 1118 | 743 | 171 | 2486 |
| | % | 18.38 | 44.9 | 29.8 | 6.8 | 100 |
| High openness | N | 265 | 759 | 638 | 87 | 1749 |
| | % | 15.5 | 43.3 | 36.4 | 4.8 | 100 |
| Low openness | N | 258 | 765 | 480 | 151 | 1654 |
| | % | 15.5 | 46.2 | 29.2 | 9.1 | 100 |

on the codes presented in our codebook.) Table 3 shows the coding scheme for the messages. After that, we measured the inter-rater reliability of our coding. Then, we calculated the inter-rater reliability, which is used to measure the level of agreement between raters (Berelson, 1952) (Miles et al., 1994). The results show an inter-rater agreement of 97%.

Table 4 shows the number of messages in each category sent from each personality.

Later, we looked in our data and tried to find a common pattern in terms of learners' personalities. We found that highly conscientious learners often included a greeting in their messages and that their messages generally remained on topic. Even when conscientious learners discussed something off topic, they were usually discussing the experiment and what they needed to do to complete the experiment. In contrast, highly extroverted learners often sent multiple messages, began their messages with greetings, and had off-topic discussions. For example, they talked about football games and tourist places to visit. Highly agreeable learners often used messages to introduce themselves and build relationships. For example, some of these learners were asking if they could have a real-time meeting. Highly open learners preferred to talk about travel and fashion, and they usually talked about their favourite places to visit. These learners usually send links about the course. Highly neurotic learners rarely opened the chat dialogue. Most of their discussions were off topic. They were complaining about their school and homework. For example, one asked, "Do you have the same amount of homework as we have? I am tired from all of it". Figure 3 shows an example of the pattern of messages from the different personalities.
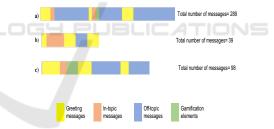


Figure 3: A Sample from the Pattern of Learners' Conversation for: a) Highly Extrovert, b) Highly Conscientious, c) Highly Agreeable learners.

Additionally, to understand the effect of the number and the type of messages on learners with different personalities, we looked to the knowledge gain and the satisfaction of the learners. Table 5 summarises the results of the learners' knowledge gain in both versions, while Table 6 summarises the results of satisfaction. Both tables show variations between personalities in response to the chat. For example, highly neurotic learners were not satisfied with the chat. However, highly extroverted learners are shown to have the most learners affected by the chat. These learners were satisfied with the presence of the chat. However, this negatively affected their knowledge gain, perhaps because learners were busy talking

Table 5: The Summary of the Results of the Knowledge Gain for the Personalities.

| Personality | Knowledge gain in version includes chat | | | Knowledge gain in version without chat | | | The benefit of the chat |
|---|---|---|---|---|---|---|---|
| | N | Mean | Sd | N | Mean | Sd | |
| High conscientious | 22 | 2.12 | 1.5 | 12 | 2.58 | 1.7 | -0.46 |
| Low conscientious | 16 | 2.5 | 0.45 | 13 | 2.15 | 1.86 | 0.35 |
| High extraversion | 23 | 1 | 2.1 | 24 | 2.0 | 1.45 | -1.04 |
| Low extraversion | 22 | 2.04 | 1.9 | 12 | 1.3 | 1.55 | 0.71 |
| High agreeableness | 16 | 1.2 | 2.4 | 17 | 2.17 | 1.81 | -0.97 |
| Low agreeableness | 15 | 1.06 | 2.3 | 12 | 1.91 | 1.44 | -0.85 |
| High neuroticism | 18 | 0.87 | 2.2 | 15 | 1.2 | 2.27 | -0.33 |
| Low neuroticism | 26 | 1.61 | 1.9 | 14 | 2.5 | 1.28 | -0.89 |
| High openness | 21 | 1 | 2.4 | 16 | 2.37 | 1.5 | -1.37 |
| Low openness | 26 | 1.34 | 1.5 | 14 | 1.64 | 1.9 | -0.3 |

Table 6: The Summary of the Results of the satisfaction for the Personalities.

| Personality | Satisfaction in version includes chat | | | Satisfaction in version without chat | | | The benefit of the chat |
|---|---|---|---|---|---|---|---|
| | N | Mean | Sd | N | Mean | Sd | |
| High conscientious | 22 | 6.67 | 0.6 | 12 | 6.1 | 0.76 | 0.57 |
| Low conscientious | 16 | 6.4 | 0.78 | 13 | 6.07 | 0.73 | 0.33 |
| High extraversion | 23 | 6.64 | 0.58 | 24 | 6.1 | 0.49 | 0.54 |
| Low extraversion | 22 | 6.6 | 0.53 | 12 | 6.01 | 0.73 | 0.59 |
| High agreeableness | 16 | 6.34 | 0.9 | 17 | 6.2 | 0.96 | 0.14 |
| Low agreeableness | 15 | 6.4 | 0.78 | 12 | 6.3 | 0.77 | 0.1 |
| High neuroticism | 18 | 5.1 | 0.7 | 15 | 6.3 | 0.87 | -1.2 |
| Low neuroticism | 26 | 6.3 | 0.78 | 14 | 6.3 | 0.75 | 0 |
| High openness | 21 | 6.5 | 0.78 | 16 | 6.3 | 0.83 | 0.2 |
| Low openness | 26 | 6.3 | 0.87 | 14 | 6.3 | 0.8 | 0 |

and chatting, not concentrating on the course itself.

# 5 DISCUSSION

This study tried to investigate the behaviour of the presence of the chat in an online learning course on learners with different personalities.

Highly conscientious learners are described by (Laidra et al., 2007), as those learners who always do their job without the need for external factors. These learners spent their time in the chat talking about the course itself or about off-topic subjects that were still related to the experiment. For example, they asked each other how much time they needed to finish the course or if they needed to contact someone when finishing an experiment. This may explain why these learners were more satisfied in the version which includes the chat. Further, highly conscientious learners always have their own trigger to motivate them. For that, these learners have the same level of knowledge gain in both versions (including and not including chat).

Highly extroverted learners spent their time chatting about topics not offered by the course. This chatting enhanced these learners' satisfaction. However, the results from the knowledge gain differ from those in related work that suggest that the existence of social components enhances these learners' outcomes (Swan and Shih, 2005). The knowledge gain of the highly extrovert learners was worse in the version including chat. This result may be explained by the fact that highly extrovert learners are easily distracted. However, this result cannot be guaranteed and we may need to run another study to validate this.

Highly agreeable learners ranked second in sending the highest number of messages. Furthermore, most of the messages were classified as a 'greeting'. These learners tried to build a relationship with their conversational partner. For example, they asked, 'How are you?', 'Where are you from?' and 'Can we meet somewhere?'. The messages sent from this personality adversely affected their knowledge gain. These learners' knowledge gain was better in the version that without the chat. Further, the satisfaction of these learners was almost the same in the both versions.

For the highly neurotic learners, we hypothesised that these learners will be demotivated because of the chat. These learners did not use the chat, and there were very few messages sent from this personality. Further, most of the messages sent from these highly neurotic learners were from those students with very high values in other dimensions, such as agreeableness. This may be explained by the nature of the study, as the chat was optional, and the learner had to take the initiative.

Highly open learners were shown to have the same level of satisfaction in both versions (including and not including chat). However, the knowledge gain was negatively affected by the chat. This might have happened because of these learners' lack of interest in the chat. These learners are described by (Costa and McCrae, 2008) as learners who are more likely imaginative and enjoy unusual events. Thus, the chat may not interest these learners.

In our study, we noticed that some learners opened the chat dialogue without starting a conversation. Moreover, when learners started a conversation, they

were unsure with whom they were speaking. This may have prevented learners from participating actively in conversations. (Cobb, 2009) pointed out that learners speaking to anonymous entities may feel uncomfortable participating in such conversations. In addition, delays in sending and receiving messages, for example, due to a poor Internet connection, could have affected the learners' behaviour.

Thus, because of the previous shortcomings, we may need to conduct a further experiment with more realistic chat. We can, for example, make the learners contact each other and record the conversation between them. In addition, we can repeat the same experiment, but take the initiative to discern how different personalities will respond.

# 6 CONCLUSIONS

Because of the lack of physical interaction between learners in online courses, many studies have suggested incorporating social elements into those courses to prevent learners from feeling isolated. Interactions with teachers and other learners can be achieved using chats, discussion boards and emails (DeSchryver et al., 2009). However, some research has claimed that some learners do not prefer to talk to others, while others may get distracted because of these interactions (Laidra et al., 2007). Some learners may also feel insecure in online interactions (Tu and McIsaac, 2002). Because of these varied responses to social components, we designed this study to investigate how different personalities respond to existing social components, such as chat.

The results from our study confirm the variation of the effect of chat on the different personalities. Some learners enjoyed using the chat. Some personalities spent their time talking about off-topic subjects rather than the course, while others preferred to build relationships and introduce themselves. This variation in the response to the chat affected learners' knowledge gain and satisfaction. For example, Some personalities are not expected to show any difference in their knowledge gain and satisfaction either with or without the social element, such as highly conscientious learners. However, other learners are more satisfied where there is a social element. Meanwhile, some learners have less knowledge gain where there is chat, such as the highly extrovert learners. These learners have the highest number of messages. Most of their messages are about topics other than the course itself, for example: fashion, travel and sport. To enhance the knowledge gain of these learners, we may need to observe the behaviour of these learners, and then direct

the conversation back to the topic itself. For example, if the learners start to talk about an off-topic subject, one might say, 'This is okay, but let's talk about the course'.

This study provides insight into the type and number of messages sent by different personalities. However, in this experiment, only a few learners with extreme personalities were included. In addition, there was a positive correlation between personalities, which may have resulted in bias. In this experiment, the learners had to take the initiative and start a conversation; as such, some learners chose not to talk. Thus, we could not examine the effect of the chat on them. Furthermore, the researchers responded to the learners, which may have resulted in delayed or uninteresting responses. Thus, further studies need to be conducted to have a better understanding of the effect of social components on learners. In this study, we used personality as a stable characteristic related to individuals' behaviour. However, there are other characteristics that may be considered (e.g. learners' effective state, mood and learning style). After building a good understanding about what is needed and liked by each learner, we can build a system that provides a dynamic place for learners' conversations. This can be done by controlling and directing the conversation for some learners or by encouraging some learners to interact more with others.

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