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Research Article

Influence of Learning Modality on Dental Students' Human View: Face-to-Face Experiential vs Online Learning

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Abstract

Objective: Experiential learning is known to be effective in medical professionalism education. In the school, an experiential learning course was offered to second-year dental students before the COVID-19 pandemic. During the pandemic, the course was replaced with online classes for three years due to infection control measures. This study investigated the difference in educational effect on students' human view between face-to-face experiential learning and online class.

Methods: Students' human view were surveyed using a self-administered questionnaire, administered immediately before the first class and after the final class. Survey responses from 467 students who took the course before the pandemic were categorized as the Experiential Learning Group (EXL), while responses from 100 students who took the course during the pandemic were categorized as the online Distance Learning Group (DLC). The responses of both groups were analyzed using factor analysis to reveal changes in the underlying structure of students' perceptions.

Results: In the EXL group, six factors were extracted by factor analysis before the course, while five factors were extracted after the course. Factors related to self-belief, beliefs about humanity and understanding others were integrated into a single factor of human esteem through the face-to-face experiential learning course. In contrast, in the DLC group, six factors were extracted before the course, while seven factors were extracted after the course. No integration of factors was observed;instead, the variation in factors increased during online classes.

Conclusion: Experiential learning in face-to-face settings appears to facilitate the reconstruction of human view by integrating their perceptions of self, others and humanity in general. This integration could not be observed in online classes. Establishing social interaction would be one of the key issues to achieve such perspective integration.

Keywords: Experiential Learning;Online Class;Social Interaction;Self-Administered Questionnaire;Factor Analysis;Affective Domain;Professionalism

Introduction

The COVID-19 pandemic has had an unprecedented impact on educational systems worldwide, resulting in rapid and fundamental changes in how education is delivered. School closures and the widespread adoption of remote learning significantly affected teacher-student interactions, the learning environment and even the overall quality of education [1-5]. Amid these challenges, the acceleration of digital education emerged as a key development, with online learning now becoming an integral part of daily education. This shift has opened new possibilities for the future of teaching and learning. Many studies have compared the characteristics of online learning with traditional face-to-face learning. Some reports highlighted the importance of social interaction in online classes and the importance of teachers' social skills and their ability to foster social presence in online environments has been emphasized [6-11]. However, almost all the reports led conclusions using subjective evaluation of class made by students and/or teachers and outcome difference between face to face and online learning has not been analyzed.

Since 1994, our school has offered a course designed to help students develop human view through experiences at off-campus welfare facilities. In this course, students reflected on their human view using a self-administered questionnaire. During the COVID-19 pandemic, experiential learning was replaced with online classes. The present study analyzes the changes in students' cognitive structures related to human view including social interaction during the course using factor analysis. The differences in perspective changes between face-to-face experiential learning and online classes were investigated.

Methods

Questionnaire for Reflection

The contents of the questionnaire are shown in Table 1. The questionnaire consists of twenty items examining beliefs related to inter-personal relationships. Students indicated their perceptions of twenty items using a 4-point rating scale (1: strongly agree, 2: agree, 3: disagree, 4: strongly disagree).

Course Progress

The course consists of three parts. The first part is preparatory classes for experiential learning consisting of lectures and communication exercises. The second part is experiential learning at a welfare facility for four or five days. The third part is reflection classes consisting of a plenary session and Small Group Discussions (SDGs) (Fig. 1). Students' reflection used the questionnaire was conducted at the first class and at the last class each year.

Subjects

Four hundred eighty-eight students who took this course before the pandemic between 2005 and 2009 or between 2011 and 2014 were categorized as the Experiential Learning Group (EXL). One hundred fifty-five students who took the course during the pandemic, between 2020 and 2022, were categorized as the Online Distance Learning Group (DLC).

Statistical Analysis

Cronbach's alpha was then calculated for each of the survey response scores from the first class (EXL1) and final class (EXL2) of the experiential learning group and for the first class (DLC1) and final class (DLC2) of the distance learning group. Next, the scores were evaluated using factor analysis, employing the maximum likelihood method and varimax rotation for each of EXL1, EXL2, DLC1 and DLC2. Factors with an eigenvalue ≥1 were extracted and named based on Items with factor loadings greater than 0.35.

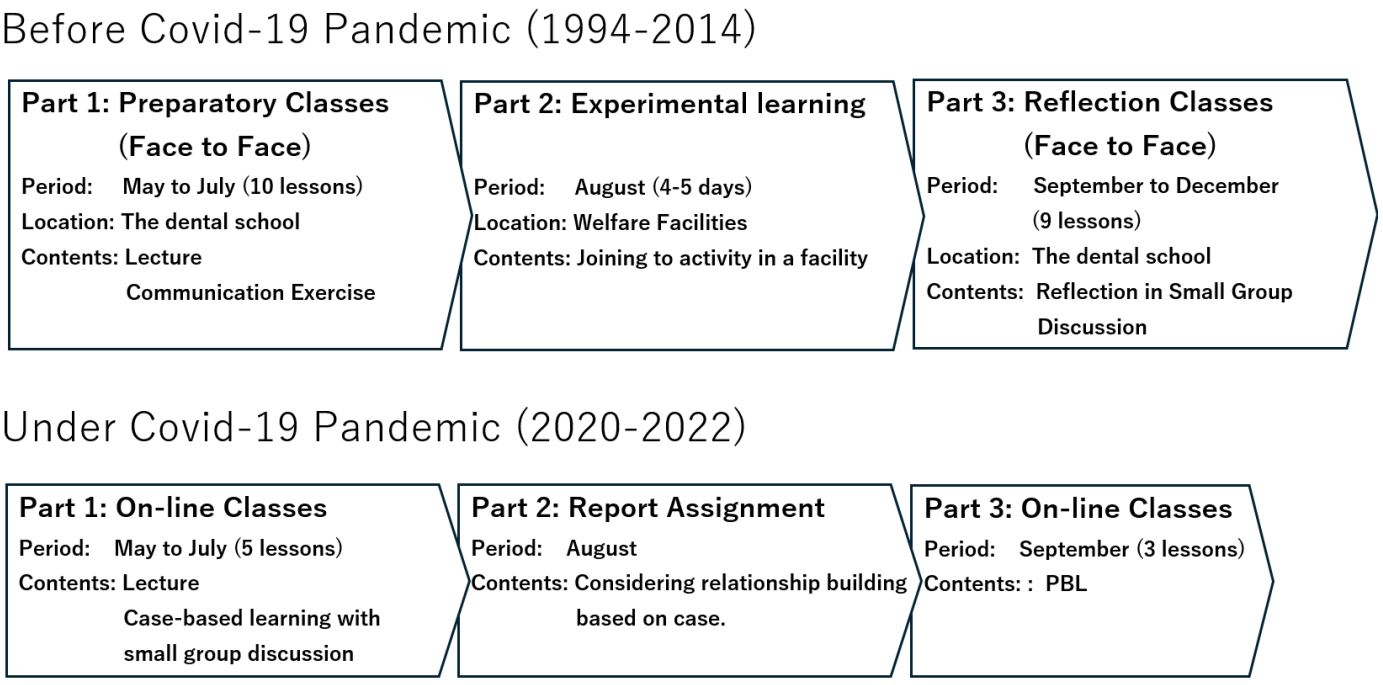

Figure 1: Schedule of the course.

Item No.	Belief
1	I always try to respect others.
2	I communicate with others trying to understand them.
3	I understand myself very well.
4	I can have different points of view.
5	I cannot understand others when their logic is different from mine.
6	I can understand others when I have enough knowledge about them.
7	I can change my behavior when I can understand a logical reason for that change.
8	I feel emotion is really meaningful for humans.
9	I consider each human being irreplaceable.
10	I think humans can understand each other.
11	I think humans can change.
12	I think that to understand others means to know their secrets.
13	One needs to know oneself to develop a good relationship with others.
14	I consider myself a human being rather than a medical provider.
15	I can say what I feel to others freely.
16	I can express myself frankly.
17	I am willing to associate with others whose way of thinking is different from mine.
18	I do not associate with people whom I do not like.
19	I can accept my imperfections and my weaknesses.
20	I value my originality.

Table 1: Interpersonal relationship beliefs on the questionnaire.

Ethical Approval

The present study was approved by the ethical committee of the Faculty of Dentistry, Tokyo Medical and Dental University (D2018-063-01).

Results

Students who did not submit a survey form, as well as those who submitted forms with missing values, were excluded from the analysis. As a result, the number of subjects of each EXL and DLC were 467 and 100, respectively. Cronbach's alpha values for EXL1, EXL2, DLC1 and DLC2 were 0.717, 0.763, 0.745 and 0.730, respectively.

The results of factor analysis for EXL1 are shown in Table 2. In EXL1, six factors were extracted, accounting for 39.06% of the cumulative variance. Based on the items composing each factor, the following names were assigned in order of factor contribution: Factor 1, Self-Disclosure;Factor 2, Acceptance of Diversity;Factor 3, Beliefs about Self;Factor 4, Understanding People through Knowledge;Factor 5, Beliefs about Humanity in General;and Factor 6, Understanding Others.

The results of the factor analysis for EXL2 are shown in Table 3. In EXL2, five factors were extracted, accounting for 38.49% of the cumulative variance. Of the five factors, Self-Disclosure, Acceptance of Diversity and Understanding People through Knowledge were extracted with the same Item composition as in EXL1. However, Items that composed Beliefs about Self, Beliefs about Humanity in General and Understanding Others in EXL1 were, except for Items 4 and 9, integrated into a single factor, which was designated "Human Esteem" based on its content. Item 3, which was not a part of any factor in EXL1, formed a factor with Items 4 and 9 in EXL2 and this was designated "Self-Reflection". The results of the factor analysis for DLC1 are shown in Table 4. In DLC1, six factors were extracted, accounting for 46.77% of the cumulative variance. Comparing the Item composition of each factor with EXL1, factors related to Understanding Others, Acceptance of Diversity and Understanding People through Knowledge were extracted with almost the same Item composition and thus were similarly designated. However, three of the five Items that comprised Beliefs about Self in EXL1 were integrated with two Items from Human Esteem, forming a factor designated "Self-Esteem," while two Items were integrated with the Self-Disclosure factor in EXL1, forming a factor designated "Self-Affirmation".

The results of the factor analysis for DLC2 are shown in Table 5. In DLC2, seven factors were extracted, accounting for 50.3% of the cumulative variance, which is an increase in the number of factors compared to DLC1. When examining the Items that comprised each factor, Self-Esteem, Understanding Others, Understanding People through Knowledge and Self-Disclosure were extracted with nearly the same Item composition as in EXL1 or DLC1. A factor similar to Beliefs about Self in EXL1 was also extracted and designated accordingly. In addition, there were factors composed solely of Item 10 or Item 17, respectively. Additionally, three Items that did not participate in any factor were identified, indicating a tendency for the factor structure to be more difficult to extract compared to those in EXL1, EXL2 and DLC1.

Name of the Factor	Item	Loading	Variance Explained (%)
Factor 1 Self-Disclosure	Item15	0.772	7.16
	Item16	0.748	
Factor 2 Acceptance of Diversity	Item 5	0.605	6.96
	Item17	0.644	
	Item18	0.499	
Factor 3 Beliefs about Self	Item 4	0.422	6.81
	Item13	0.388	
	Item14	0.425	
	Item19	0.445	
	Item20	0.518	
Factor 4 Understanding People through Knowledge	Item 6	0.597	6.76
	Item 7	0.8	
	Item12	0.401	
Factor 5 Beliefs about Humanity in General	Item 8	0.455	6.31
	Item 9	0.525	
	Item10	0.588	
	Item11	0.353	
Factor 6 Understanding Others	Item 1	0.742	5.06
	Item 2	0.492	
Item not included in factors	Item 3		
Cumulative			39.06

Table 2: The results of the factor analysis for EXL1.

Factor	Item	Loading	Variance Explained (%)
Factor 1 Human Esteem	Item 1	0.464	12.55
	Item 2	0.546	
	Item 8	0.653	
	Item 9	0.697	
	Item10	0.41	
	Item13	0.464	
	Item14	0.376	
	Item20	0.428	
Factor 2 Understanding People through Knowledge	Item 6	0.737	6.88
	Item 7	0.628	
	Item12	0.442	
Factor 3 Self-Disclosure	Item15	0.708	6.87
	Item16	0.747	

Factor 4 Acceptance of Diversity	Item 5	0.679	6.19
	Item17	0.49	
	Item18	0.495	
Factor 5 Self-Reflection	Item 3	0.473	6.00
	Item 4	0.426	
	Item19	0.551	
Item not included in factors	Item11		
Cumulative			38.49

Table 3: The results of the factor analysis for EXL2.

Name of the Factor	Item	Loading	Variance Explained (%)
Factor 1 Self-Esteem	Item14	0.650	9.578
	Item13	0.593	
	Item9	0.546	
	Item8	0.501	
	Item19	0.427	
Factor 2 Self-Affirmation	Item15	0.851	9.181
	Item16	0.727	
	Item20	0.374	
	Item4	0.354	
Factor 3 Understanding Others	Item2	0.978	8.801
	Item1	0.582	
Factor 4 Acceptance of Diversity	Item18	-0.587	7.304
	Item17	0.577	
	Item11	0.381	
	Item5	-0.462	
Factor 5 Understanding People through Knowledge	Item6	0.889	7.175
	Item7	0.385	
	Item3	0.356	
Factor 6 Human understanding	Item10	0.844	4.735
Item not included in factors	Item 12		
Cumulative			46.770

Table 4: The results of the factor analysis for DLC1.

Name of the Factor	Item	Loading	Variance Explained (%)
Factor 1 Beliefs about Self	Item04	0.732	8.900
	Item19	0.666	
	Item03	0.412	
	Item20	0.392	
Factor 2 Self-Esteem	Item13	0.657	8.296
	Item08	0.600	
	Item14	0.513	
	Item09	0.465	
Factor 3 Self-Disclosure	Item15	0.968	7.962
	Item16	0.651	
Factor 4 Understanding Others	Item02	0.973	7.060
	Item01	0.483	
Factor 5 Understanding People through Knowledge	Item05	0.577	6.931

	Item06	0.628	
	Item07	0.647	
Factor 6 Acceptance of Diversity	Item17	0.919	6.269
Factor 7 Human understanding	Item10	0.742	4.898
Item not included in factors	Item11		
	Item12		
	Item18		
Cumulative			50.320

Table 5: The results of the factor analysis for DLC2.

Discussion

Experiential learning and subsequent reflection are effective educational strategies for fostering medical professionalism. Experience and reflection are essential components in the processes of abstract conceptualization and subsequent active experimentation [12-16]. Furthermore, it has been reported that experiential learning facilitates the acquisition of tacit knowledge, which is difficult to articulate or teach explicitly [17,18]. At our institution, this experiential learning course is utilized as part of our professionalism education, specifically aimed at cultivating students' human view. The questionnaire used in this study was originally developed to facilitate students' self-reflection on human view and has been in use since the course was first introduced in 1994. Thus, the questionnaire was not originally developed for the purpose of the present analysis. Nevertheless, it is considered to have face validity, as the clinical psychologist who conducted the course at the time carefully examined whether the content was consistent with the educational objectives. Furthermore, in the present study, the Cronbach's alpha was approximately 0.7, indicating acceptable internal consistency. Factor analysis is a statistical method that identifies underlying factors by grouping observed variables based on their intercorrelations. In the present study, factor analysis was employed to examine changes in students' cognitive frameworks by analyzing shifts in the correlations among questionnaire Item s. The results revealed the presence of both consistently extracted factors across all survey periods and factors that varied over time. Among the former, the factors of "Self-Disclosure," "Acceptance of Diversity," and "Understanding People through Knowledge" were consistently identified before and after the course, as well as before and during the COVID-19 pandemic. This suggests that the course did not lead to changes in the underlying structure of these conceptual domains. In contrast, Items related to beliefs about respect for humanity and understanding of others showed variations in factor structure depending on the timing of the survey, indicating that the meanings conveyed by these factors changed over time. These results suggest that students' cognitive structures regarding these particular concepts evolved. The following section discusses these changes as reflections of the educational effects of the course. In the factor analysis conducted prior to the course, based on data collected before the COVID-19 pandemic, three distinct factors emerged from Items related to humanity and the understanding of others. These factors reflect differentiated orientations toward the self, others and humanity in general. Following the completion of the course, these three factors were integrated into a single factor, suggesting that the course facilitated a cognitive transformation, leading to a more unified perception of the self, others and human nature. Selman [19,20] defined the capacity to understand and infer the psychological states of oneself and others in social and interpersonal contexts as "social perspective-taking." According to this framework, social perspective-taking develops in sequential stages, progressing from a subjective viewpoint to second-person, third-person and ultimately to a socially symbolic perspective. Similarly, the observed integration of perspectives in the present study may be interpreted as a reflection of the consolidation of social viewpoints, symbolized by shifts in referential perspective. This finding implies that the experiential learning implemented in the course may have supported the reconstruction of students' social perspectives, thereby contributing to their professional development. Pagatpatan, et al., emphasized the importance of community-based education, particularly the role of reflection within the affective domain [21]. Reflection is not merely an individual mental process but also a socially situated process [22]. Moreover, reflection can be categorized into two types: "reflection-in-action," which occurs unconsciously during the experience and "reflection-on-action," which takes place consciously after the experience has occurred [22-24]. In the pre-COVID-19 curriculum of this course, considerable time was allocated to "reflection-on-action" through SGDs and plenary sessions following experiential activities. This learning strategy, centered on reflection as a social activity, likely contributed to the integration of perspectives. Furthermore, the intentional engagement in "reflection-on-action" may have heightened students' metacognitive awareness of the reflective process itself, thereby facilitating the development of a cognitive framework for self-reflection. As a result, it is presumed that "Self-Reflection" emerged as a newly identified factor in the post-course analysis.

In contrast to the pre-COVID-19 period, the factor analysis conducted prior to the course during the COVID-19 pandemic did not identify any factors related to an integrated belief in humanity that encompasses multiple perspectives. Instead, factors named Self-Esteem and Self-Affirmation were extracted. Self-esteem and self-affirmation are considered psychological mindsets that contribute to enhanced resilience [25-27]. During the period of social isolation caused by COVID-19, especially among students living alone, reports indicated significant limitations in social connectedness and highly stressful living conditions [28-30]. Under such circumstances, students may have been compelled to adopt cognitive strategies that promoted psychological resilience. Consequently, the emergence of self-esteem and self-affirmation as factors in the COVID-19 period may reflect adaptive coping mechanisms developed in response to the pandemic environment.

In the post-course survey conducted during the COVID-19 pandemic, a greater number of factors were extracted compared to the pre-course survey. Additionally, there was also an increase in the number of Items that did not load onto any factor. This suggests a tendency toward greater divergence in students' perceptions, rather than the formation of a shared understanding. Previous studies have reported that online learning environments reduce social processes such as interaction with peers and instructors, which can negatively affect learning outcomes [3]. Furthermore, in online settings, social presence plays a critical role in performance;not only cognitive recognition but also emotional engagement is necessary to facilitate meaningful information exchange [31]. In the present study, reflections conducted during the pandemic were based on text-based case analyses rather than real-world social interactions with service users or supervisors in welfare facilities. As a result, the amount of time devoted to "reflection-on-action" was limited and the social presence of both students and instructors was also diminished. It is plausible that these conditions of online learning hindered the development of shared understanding during SGDs, leading to greater variability in students' cognitive representations. As this course spans several months, students are exposed to various experiences not only through the course content but also in their daily lives. Particularly during the COVID-19 pandemic, informal communication between students and instructors outside of class was severely restricted. The absence of basic interpersonal interactions in everyday life may also have influenced students' perceptions and learning outcomes. Therefore, the findings of this study should not be interpreted solely as a comparison of instructional strategies, but rather should be understood within the broader socio-contextual framework in which the course was delivered.

The results suggest that the COVID-19 pandemic did more than simply accelerate digital transformation in the educational field-it also highlighted the fundamental importance of social interaction in learning. As we consider educational strategies in the post-COVID-19 era, a key challenge will be how to incorporate social processes into digital learning environments.

Conclusion

Experiential learning in face-to-face settings appears to facilitate the reconstruction of students' human view by integrating their perceptions of self, others and humanity in general. On the other hand, this cognitive integration was not observed in students attending online classes during the COVID-19 pandemic. Establishing social interaction would be one of the key issues to achieve such perspective integration.

Conflict of Interest

The authors declare that they have no conflicts of interest with the contents of the article.

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Author Contributions

All authors contributed equally for this paper.

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