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An Interface for Enhanced Teacher Awareness of Student Actions and Attention in a VR Classroom

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Abstract

Networked VR is gaining recognition as a way to provide remote presentations or classes when in-person meetings are difficult or risky to conduct. However, the tools do not provide as many cues about audience actions and attention as in-person meetings, for example, subtle face and body motion cues are missing. Furthermore, the field of view and visual detail are reduced, and there are added problems such as motion sickness, network disconnections, and relatively unrestricted avatar positioning. To help teachers understand and manage students in such an environment, we designed an interface to support teacher awareness of students and their actions, attention, and temperament in a social VR environment. This paper focuses on how different visual cues are integrated into an immersive VR interface that keeps relevant information about students within the teacher's visual field of attention. Cues include floating indicators, centrally-arranged face icons with gaze information, tethers and other indicators of avatar location, and options to reduce the amount of presented information. We include a pilot study of user preferences for different cue types and their parameters (such as indicator style and placement with respect to the teacher).

Index Terms: Computing methodologies—Computer graphics—Graphics systems and interfaces—Virtual reality; Human-centered computing—Visualization—Visualization design and evaluation methods; Applied computing—Education—Distance learning

1 Introduction

Virtual reality (VR) has long been suggested as a way to enhance education. Researchers recently deployed networked VR to deliver remote presentations to broaden access or overcome risks of in-person meetings during the spread of the SARS-CoV-2 virus. For example, Mozilla Hubs [3] was used for the IEEE VR 2020 conference and Virbela [5] was used for ISMAR 2020. Others have considered that networked social VR tools might be valuable for remote classrooms by supporting co-presence or other aspects lacking in video-only tools, e.g., [25, 31]. Students seem to appreciate being seen as avatars rather than on camera [30]. More general benefits of VR for education may include increased engagement and motivation of students, better communication of size and spatial relationships of modeled objects, and stronger memories of the experience.

In in-person classrooms, teachers have a sense of the audience's engagement and actions from cues such as body movements, eye gaze, and facial expressions. In a VR environment, this awareness is reduced, as some cues are tracked or reconstructed coarsely (especially in everyday VR) and the displays have limited resolution and field of view. Furthermore, student avatars may appear in a relatively unconstrained location (like hovering in the air for a better view [31]) and students may encounter discomfort or technical difficulties not associated with in-person meetings. For example, a study of Mozilla Hubs noted students had difficulty asking questions and getting the teacher's attention, although Hubs has an audible beep and question text in the environment [30, 31]. Additionally, some students encountered discomfort, technical problems, and distractions from both the VR environment and from other student avatars [30].

For a VR-immersed teacher to better understand students and respond to problems or actions, we developed a visual interface for providing an overview of students within the teacher's field of attention. One goal is to clarify student actions and locations and to let the teacher better identify problems. The interface can also summarize head or eye gaze and attention levels or temperament as may be determined by motion or physiological sensors (this paper focuses on visual cues and not on the mechanisms to detect such states). We describe the different visual elements and then report a pilot study on user preferences for different visual options.

2 Related Work

There is a growth in social VR (Rec Room [4], AltspaceVR [1], Virbela [5], VRChat [6], Anyland [2], Mozilla Hubs [3]) and its consideration for remote classes (e.g., [25, 31]). Yoshimura et. al. noted desirable but missing communication features in a VR classroom using Mozilla Hubs, including a clear visual way to get the teacher's attention and more complete chat features [30, 31]. Some students reported substantial "general discomfort". Over half of them reported audio or video problems, and about half reported some distraction by noises from their physical home environment. Thus, we expect that some problems in VR classrooms differ from in-person classrooms, and we believe a teacher can benefit from awareness of both traditional and VR-related problems of students.

Increased sensing such as eye tracking is coming to commercial VR devices (e.g., Vive Pro Eye). Recent trends suggest an increase in sensing and AI for detecting facial motion or physiological properties to infer or communicate psychological states (e.g., MindMaze Mask, LooxidVR, HP Reverb G2 Omnicept, Facebook Codec Avatars). Useful information for class management might include emotional engagement based on electrodermal readings [17, 28], cognitive load and attention based on blinking rate and fixation time [13, 22], or stress based on cardiovascular readings [11, 20, 21]. In a simpler case, showing eye gaze direction can give one user insight into the attention level of another [26]. Thanyadit et al. considered showing up to 40 students and emphasizing their gaze by using altered avatar positions for aesthetic reasons and to avoid visual clutter [27]. Others considered gaze visualizations at looked-at points to show student attention [23].

For large classes, naively visualizing indicators of all students may lead to clutter, motivating methods to reduce displayed information. One general object placement approach is to optimize placement and visibility based on the viewer's cognitive load and context [18]. Even if clutter is avoided, a large virtual environment can lead to missed information. VR applications can make use of visual cues that point to off-screen objects or call attention to screen areas closest to off-screen objects [12, 14, 24, 32]. Some systems have proposed secondary cues, such as auditory indicators, for this purpose [19]. We expect that audio cues would be useful for critical alerts, but a lecturing teacher may miss moderate cues [30, 31] or be distracted from lecturing by frequent cues. Another way to represent off-screen objects is through maps or 3D radars [9].

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Figure 1: Default indicator display (single-row)

3 Interface Design

Our VR environment resembles social VR tools like Mozilla Hubs, with simple avatars for students (Fig. 1). We add a visual interface to compactly present key information about the class in the teacher's field of attention. Three main components work in tandem: a scoring component to classify student behavior, an indicator placement component that mitigates clutter, and a display component.

3.1 Scoring and Student Actions

Simultaneously showing information for many students is problematic due to clutter. Clutter also becomes excessive if too much low-level data about students is displayed. Our solution to these problems includes an importance scoring system that first attempts to determine whether or not a student has a problem (such as a distraction) or is performing an action that the teacher needs to be aware of. This top-level per-student importance score indicates whether or not the teacher needs to be especially aware of (and therefore see an indicator for) that student. Most students will be generally aware and passively listening, so the teacher does not need to see indicators for every student, especially in large classes. The teacher can choose to see indicators for all students if desired. There is a tradeoff between seeing only the most critical student (alerts) and seeing more students for a full overview (with more clutter).

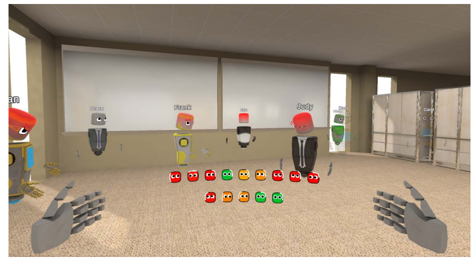
One factor of importance is a student's attention level, which we currently estimate from eye gaze, using the relevance and timing of multiple gazed-at objects [15]. Relevant objects include the teacher's avatar and objects recently looked at or gestured to by the teacher, so that students looking such objects (including presentation slides) are considered attentive.

Actions consist of deliberate student behavior that might alert the teacher. Currently implemented actions are raising a hand, speaking into a microphone, and typing on a keyboard. Notably, raising one's hand is weighted such that it causes a student to be immediately flagged as urgent, since a student raising their hand is likely to want to immediately get the teacher's attention.

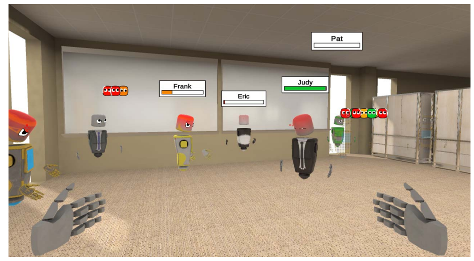
We include a temperament visualization, where temperament is loosely related to student emotion and mental state such as distress, frustration, and confusion. The detection methods are an active area of research and beyond the scope of this visual interface description (see Section 2).

3.2 Indicator Placement

An indicator is a visual element in the teacher's view that summarizes student status. It should be positioned in a way that makes the relationship to the student clear. However, the teacher's field of attention may be as small as 20 degrees (depending on the teacher's current visual task) [29], and students may be anywhere they choose, including behind or above the teacher. The "field of attention" for our indicator system is a conic region in front of the teacher's view and may vary depending on the HMD and the teacher's preference. Indicators should appear within this field of attention without cluttering it excessively. Furthermore, indicators should not obscure each other, such as multiple students indicators in one place.



(a) Class-wide



(b) Floating

Figure 2: Indicator placement options

A simple approach is to place indicators above a student's head to make the relationship between the them clear. If this point above the student's head is outside of the field of attention, the indicator will be displayed at the closest point inside the field of attention. Unlike some placement techniques involving planar layouts to avoid overlapping elements [8] or mapping spherical coordinates to a 2D target [14], we use shortest-arc rotations of indicator positions around the viewer to bring indicators to the field boundary. In effect, indicators outside of the field of attention snap to the boundary of the field of attention. So, the teacher can see the direction they must look in to bring the student's avatar into direct view. We refer to this indicator positioning as the "floating" method.

With multiple indicators in the same field, indicators could overlap. To mitigate this, nearby indicators are collapsed based on view angle between them (after being limited to be within the field of attention), with the collapsed indicator at the averaged position. Collapsing indicators reduces space required to display information for multiple students. It does, however, require some information about an individual (such as the name of the student) to be simplified or removed, depending on the display style.

As an additional trade-off that reduces clutter but may make the student-indicator spatial relationship less clear, indicators can be displayed as a single class-wide collapsed group (Figure 2). Class-wide indicators move horizontally so that the center of the indicator group remains in the field of attention of the teacher, with a fixed depth. This group will also shift upwards, vertically, only when necessary to keep it in the field of attention (based on the vertical component of the head-forward vector).

To make indicators visible when an object such as an avatar moves in front of them, we render indicators in a way that makes occluding objects appear partially transparent, as for menus in [10].

3.3 Display

To visually represent student statuses with an indicator, various visual elements are employed (see Figure 3). These elements can be arranged either within a rectangular frame or displayed within a row of similar elements. The attention bar is a color-coded representation of a student's attention score. Status icons represent some detected student action. An arrow displayed outside an indicator indicates the direction of a student that is off-screen.

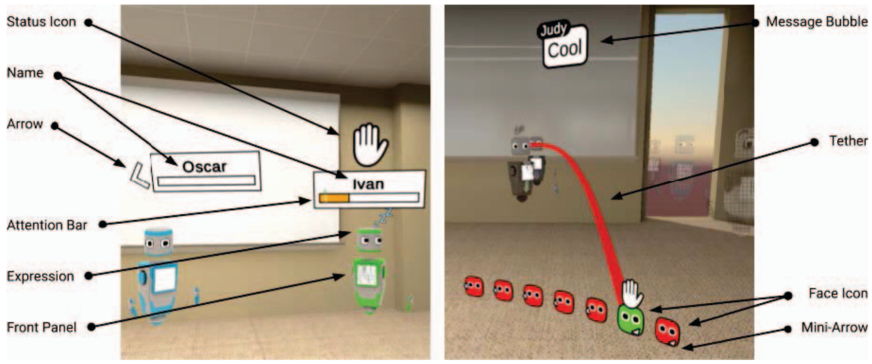
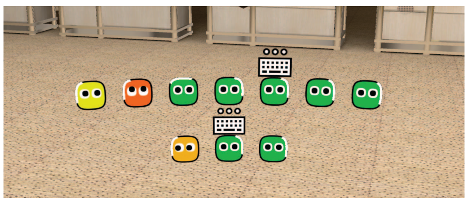
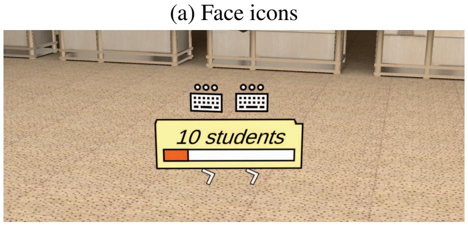


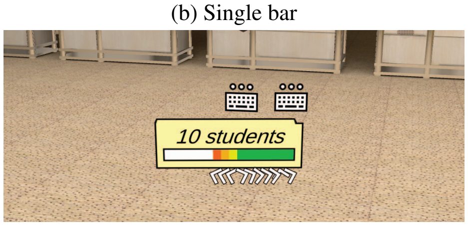
Figure 3: Visual glossary of indicator elements, for both floating (left) and classwide (right) display styles



(a) Face icons



(b) Single bar



(c) Segmented bar

Figure 4: Collapsed indicator types

3.3.1 Collapsed indicator display types

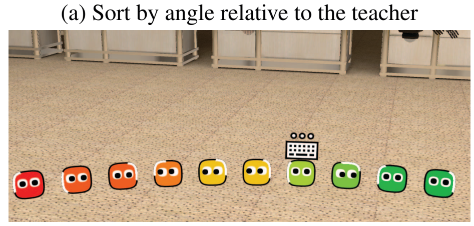
The indicators themselves have three main ways of showing information about multiple students (see Figure 4): showing multiple face icons, showing a single bar, and showing a segmented bar. Face icons are images that represent both the temperament and the importance score for one student, changing colors from green to red as the student's importance increases (other colors can be enabled for certain types of colorblindness). Above each icon is a corresponding status icon depicting any action currently being taken by that student, and each face icon has some kind of directional indicator to guide the teacher to the student. The expression of the face icon can change to mirror the temperament of the associated student, but this information may also be displayed as a status icon.

When a single bar is displayed, it displays only the most critical importance score of all students within that indicator group, thereby reducing the class summary to the most important students for the teacher to be aware of. The filled part of the bar is sized according to the student's score, and the rest of the bar is white.

The segmented bar displays multiple scores as segments within the bar, with problematic scores placed left of the center and good scores on the right, allowing the teacher to overview the score distribution. Each student's segment is equally sized and if different numbers of students are left/right, the unfilled space is white.

Because collapsed indicators display information for multiple students, some consistent method of sorting the students within the indicator is needed so that the students don't appear to shift around arbitrarily (Figure 5). By default, students to the left of the teacher appear to the left of others, and students to the right appear to the right. Specifically, this is a sort by signed angle between a forward vector and a vector pointing to the student (vectors projected in the horizontal ground plane). Students may also be sorted by importance, which causes students for the most urgent statuses to be grouped separately from those that are less urgent (Figure 5).

(a) Sort by angle relative to the teacher



(b) Sort by importance score

Figure 5: Indicator sorting options (Note that in (b), students with critical importance scores, colored red, are at the left)

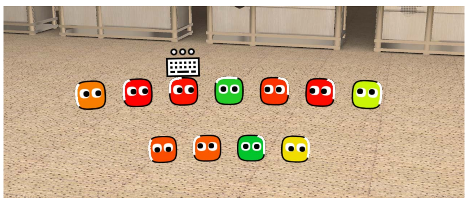
3.3.2 Elements of face icons

Face icons are clustered around the center of a collapsed indicator group, placed as described in section 3.2, and they can be arranged in one or multiple rows. For multiple rows, students are placed in rows based on their distances from the teacher, with farther distance corresponding to higher rows.

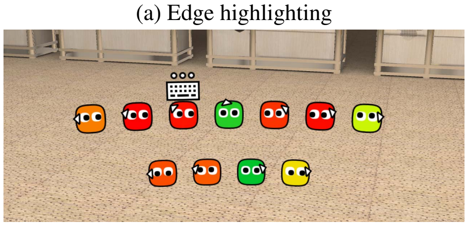
The movement of the eyes of each icon indicates where a student is looking based on eye tracking. The icon's pupil positions indicate gaze direction relative to the teacher, so that the pupils are centered when the student is looking at the teacher and diverge outwards to reveal the direction of a gaze diverging from the teacher.

The face icons can point out the positions of avatars using 3 methods as seen in Figure 6. One option displays an arrow underneath the icon, pointing to the student. A "highlight" method highlights a portion of the edge of the icon to indicate the direction. The other option is a "blip," or small arrow on the edge of the icon, pointing towards the direction of the student avatar. Edge highlighting avoids introducing additional, overlapping elements into the space of the small face icons, whereas the arrows are designed to give a stronger cue at the expense of requiring additional space underneath each icon. The "blips" are a compromise between the intelligibility and space-efficiency of the previous two methods.

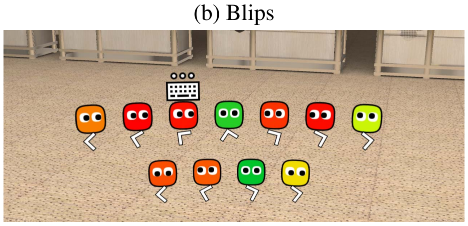
A fourth way we indicate student position is with a "tether": a 3D cubic curve connecting an indicator element to an avatar (Figure 7). The system can show tethers either for all students or for important students only. Tethers are color coded based on urgency; a critical student's tether is red and flashing, and others are semi-transparent white and thin. Tethers more directly guide a teacher to avatar positions than the on-icon cues . For individual students, tethers can be shown on-demand as described in section 3.3.4.



(a) Edge highlighting



(b) Blips



(c) Full-size arrows

Figure 6: Student positional indicators

3.3.3 On-avatar indicators

Some indicators are placed at the avatar body itself to provide the teacher with information about a student more naturally once the teacher looks at the student. The cues present when teaching face-to-face (such as facial expressions) are lost with most everyday VR avatars. Although our avatars are derived from simple Mozilla Hubs avatars, we added eye-tracker-based pupil motion and avatar expressions that affect both eye shape and head color. Some expressions incorporate animations such as drops of sweat or moving eyes. These effects are intended both to draw attention to the statuses themselves and to make the avatars seem more lively and expressive.

We currently use expressions to indicate the following temperaments (Figure 9): normal, distressed, frustrated, disoriented, tired, and confused. We also implemented three physical actions (Figure 10) that can be represented by the motion of the avatar: raising a hand, typing a message on a keyboard, and becoming frozen (for technical problems such as loss of tracking). If a student submits a response to the teacher by typing, a message bubble appears with the response text. The bubble is either displayed above the student (when directly visible) or linked to the student with a tether.

Additionally, to reduce the chance one student avatar occludes another, avatars for students with non-critical statuses are displayed as partially transparent. This allows a teacher to see behind these avatars to potentially important students or parts of the environment.

3.3.4 Responsively-triggered elements

Some elements in the interface are responsive and expose additional information when the teacher "hovers" over them with ray pointing or eye gaze (a teacher may want to avoid pointing forward excessively in a classroom). One of these elements is a panel on the avatar's chest, which flips out to display supplementary information. Currently, this information is a prototyped history graph of recent attentiveness (Figure 8). After a few seconds of hovering, the front panel expands in size and moves towards the teacher for greater visibility. We expose settings to modify this hover time and the triggering method (gaze, pointing).

Additionally, face icons, when hovered on, grow in size, display a tether to the student, and show the student's name. This information is not always useful, and presenting it all the time would increase visual clutter. But, it is helpful to provide access when needed. When hovering off of a face icon, the student's name and tether stay visible for a few seconds to ensure the teacher is able to read the student's name and follow the tether back to the student.

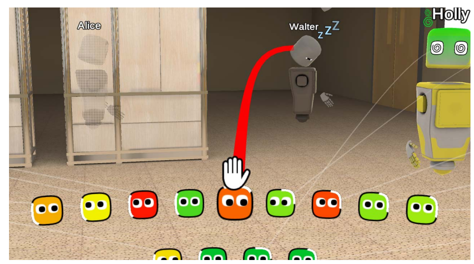


Figure 7: Tethers between face icons and students. The most urgent tether is red and prominent, and others are subtle.

4 Study Design

We had 11 subjects (8 male and 3 female, aged 23 to 38) in a pilot study to identify reasonable parameters and provide insight into our visual techniques. Subjects selected their preferred settings for various parameters (see Table 1) and explained the reason behind their preferences. Due to an ongoing pandemic, the subjects were a convenience sample of active on-campus university personnel. Most were graduate students and researchers from a computer science department, with one from a physics department and one being a professor. Three had no prior experience with educational VR, one took part in a prior VR study as a subject, and seven others worked as developers or researchers for related VR applications.

Subjects wore a headset with eye tracking (HTC Vive Pro Eye) and used a controller to interact with a presentation and switch

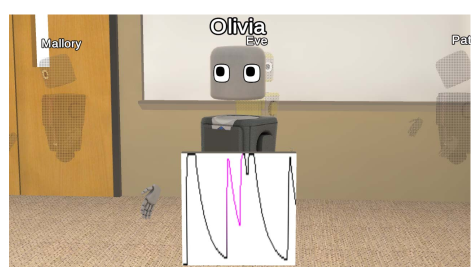


Figure 8: Front panel displaying a graph of recent attentiveness

Figure 9: Avatar expressions (from left to right): normal, distressed, frustrated, disoriented, tired, confused

Figure 10: Avatar actions (from left to right): default, raising hand, typing, frozen

between visual cue settings. Subjects were informed about eye tracking being used, and that their eye gaze was not being recorded.

Each subject was asked to imagine being a teacher while placed in a VR classroom with 20 simulated students. In VR, the subjects were positioned in front of an example slideshow explaining Java code containing an if-else statement. The simulated students looked towards the teacher most of the time, but occasionally looked away and quickly corrected their gaze. Randomized temperaments and actions were enabled for the students when the appearances of the relevant on-avatar indicators were being evaluated.

Each subject began the study with initial options randomized and tried different cue aspects in a randomized order. The investigator explained what each cue represented and how it worked, and showed the different options. Subjects could also go back and forth between options on their own before answering preference questions. There were 23 questions as summarized in Table 1.

5 Results

Regarding indicator placement, 10 of the 11 subjects preferred class-wide indicators to floating ones. They stated that it was easier to visualize if all the indicators were together, since they could see everything together at once. One subject said the floating placement could potentially be distracting while teaching, while one subject preferred floating indicators because they wanted to have a clearer idea of the students' positions and the additional information seen with separate indicators was an added advantage. Regarding collapsed indicator display technique, the subjects had more diverse opinions, with 6 of them preferring face icons, 3 preferring the segmented bar, and only 1 preferring the single bar (1 subject did not specify a preference). The high detail of the face icons was polarizing and was both an advantage for those who preferred them and a disadvantage for those who didn't. The face icons were regarded as easy to visualize and more useful for tracking and mapping individual students. Similar comments were given about the single bar display type; one subject liked its precision, whereas three subjects did not like that it did not show all the students' states in detail. Out of the 11 subjects, 10 wanted the students' names displayed over the avatars at all times to aid in identification, with one preferring they be made visible only when the student is looked at or selected.

To indicate student positions with face icons, 8 out of 11 preferred the blips over edge highlights. 5 subjects chose full size arrows over both edge highlights and blips. Overall, while three subjects thought the full size arrows were easier to follow due to their bigger size, there seemed to be more consensus that it was easier to associate each face icon with the blips and edge highlights due to their presence on the icon itself. The blips seemed intuitive as well, with one subject mentioning they liked it due to its similarity to something they saw in a game. Two other subjects found it subtle, but still informative. The blip's smaller size was the reason that two of the subjects disliked the technique. The edge highlights were not clear to two subjects. Two others assumed the highlights were part of the face icons' design, despite receiving an explanation.

Out of 11 subjects, 8 preferred face icon eyes to move to show student gaze, while one subject especially noted that fixed eyes reduce distraction. Two others didn't think the feature was a useful indicator of a student's attentiveness. Another subject, although preferring moving eyes, expressed that moving eyes would not be as effective for a larger class, saying some sort of filtering would be needed in that case. To improve the utility of the eyes on the face icons, subjects suggested modifying the eye size or using a more realistic representation.

Regarding face icon layout, 8 subjects preferred multiple (two) rows due to reduced head movement to view indicators (compared to a single wide row). The other 3 subjects preferred indicators in a single row, however, finding it less messy, especially with tethers enabled. 2 subjects wanted indicators visible for every student in the class, feeling that it would allow them to gauge how the majority of the class is doing at a glance. The other 9 subjects preferred to see indicators for important students only.

Regarding tethers, 8 subjects preferred to see tethers only for the most urgent student, as it helped them keep track of the important students more easily. Only 1 subject thought tethers were distracting and did not want to see them at all while teaching, whereas 2 subjects wanted to see tethers for every student simultaneously. On average, subjects selected a duration of 5.2 seconds for tethers to remain visible (range of 1 to 25 sec, median 3 sec). They suggested that if a tether disappeared too early, the teacher would not notice it, but it could be distracting if it did not disappear soon enough. One subject suggested that the tether should vanish only when the teacher has taken some steps to address the urgent student.

Regarding sorting, 6 of the 11 subjects wanted indicators to be sorted by student avatar position, finding that it helped them track student positions. The rest preferred sorting by attention score. Also, 5 subjects wanted the indicators sorted in descending order, with the

Table 1: Results summary. For Q16 - Q23, see Section 5

Q1	**Indicator placement**		
	Classwide : 10	Floating : 1	
Q2	**Collapsed indicator display style**		
	Face Icon : 7	A Single Bar: 1	Segments: 3
Q3	**Avatar names enabled**		
	Yes: 10	No: 1	
Q4	**Minimal student direction display style**		
	Edge Highlights: 3	Blips: 8	
Q5	**Overall student direction display style**		
	Highlights/Blips: 5	Full size: 6	
Q6	**Moving eyes enabled for face icons**		
	Yes: 8	No: 3	
Q7	**Number of rows for face icons**		
	In one row: 3	Multiple (two) rows: 8	
Q8	**Indicators appear**		
	For all students: 2	For important students: 9	
Q9	**Tethers appear**		
	When urgent: 8	Always: 2	Never: 1
Q10	**Indicator sorting criteria**		
	By importance: 5	By student angle: 6	
Q11	**Sorting order**		
	Descending: 5	Ascending: 6	
Q12	**Hover trigger method**		
	Eye tracking: 3	Controller: 8	
Q13	**Tether linger duration (seconds)**		
	Range: 1-25	Mean: 5.2	Median: 3
Q14	**Teachers' field of attention (degrees)**		
	Range: 0-50	Mean: 23.6	Median: 20
Q15	**Hover duration for front panel pop-out (seconds)**		
	Range: 1-3	Mean: 1.63	Median: 2
Q16	**Suggestions about moving eyes**		
Q17	**Suggestions about front panel graphs**		
Q18	**Preferences about showing additional student information**		
Q19	**Comments about student temperaments**		
Q20	**Preference to see more states**		
Q21	**Comments about student action states**		
Q22	**Preference to see more action states**		
Q23	**Comments about the study**		

rest wanting them sorted in an ascending order.

The subjects selected, on average, a field of attention angle of 23.6 degrees (range of 0 to 50 deg where 0 refers to fixing the indicators at the view center, median 20 deg).

Of the 11 subjects, 4 did not like the attention history graph on the front panel of the avatars, as they felt it was too much information to process. 3 others seemed to think the feature was useful as is, and the rest were mixed or felt it might be useful only in a modified form. 4 subjects thought the graphs were not designed effectively, or thought that they didn't show necessary information precisely. These subjects felt that the facial expressions on the avatars were enough in this regard, but thought that having more text information, a bar showing the attention score, or a image of the student on the avatar might be useful. On average, the subjects would like to hover over the avatars for 1.6 seconds before popping the front panel out. One of the subjects did not want the front panel at all, but for the other subjects, preferred duration ranged from 1 to 3 sec with median value 2. For hovering preference, 8 subjects preferred ray pointing, whereas 3 subjects preferred eye gaze. Eye tracking failed for one subject and that might have biased their answer. We also believe more tuning of target size/sensitivity could affect results. Both groups felt their choices involved less effort.

When asked to judge avatar expressions, five subjects suggested that frustrated students appeared angry, and 2 subjects thought we did not need all the temperaments. The tired and confused temperaments were appreciated though, and 4 of the subjects suggested additions including "bored" and "dissatisfied."

Regarding cues for avatar actions, subjects agreed that hand raising looked good as an icon on the indicators. 3 subjects felt that the (floating) on-avatar hands looked odd and suggested reducing the distance between avatar hands and torsos. One subject did not want to know about avatars typing messages at all, whereas one wanted to have the option of knowing that a student is typing without actually seeing the message itself (unless the student is directly interacting with the teacher). The rest were neutral about the actions. The subjects proposed additions including an indicator when a student is looking at their phone.

Overall, three subjects also suggested that we could reduce the amount of information shown, perhaps by using additional filtering or other organisational techniques.

6 Conclusion

We proposed an interface to help a teacher monitor students in a VR classroom. The visual cues ensure that information about a student is not obscured by other information and that large amounts of information are summarized. We conducted a pilot study to compare several types of visual cues and to fine-tune associated parameters. Participants preferred to see all student indicators in one place and suggested minimizing the amount of information displayed. They felt these modifications would help a teacher focus more effectively on the most urgent students while reducing clutter.

From the results, we will design an improved and well-adjusted interface where students would be represented by indicators displayed in a class-wide group with both indicators and tethers shown only for important students. These settings were preferred by, and seemed to work well for, the majority of subjects (10, 9, and 8 out of 11 respectively). We are also fairly confident about the use of face icons (preferred by 7 subjects, compared to 1 and 3 for bar styles) with moving eyes (preferred by 8 subjects) for use in the collapsed indicators. There is less consensus about other details, such as on-icon directional indicator style and indicator sorting criteria.

Integration with other cues, such as audio or haptic alerts, can also be considered. We expect these are useful for occasional critical alerts, but less useful for providing a continuous overview.

A key limitation of our study was that most subjects were graduate students and researchers, not professors or teachers. We consider it a pilot study to get some feedback before more formal evaluation in a teaching context. In future studies, it would be interesting to see how the adjusted interface performs with teachers simultaneously teaching lessons and managing students with the interface.

The effect on students, of a teacher using the interface (hidden from students), is also an important consideration. We propose that if a teacher gazes at indicators often, transformed or redirected gaze [7,16] could be used so that students perceive the teacher avatar as gazing at them when the teacher gazes at their indicator.

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