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# NOMINAL GROUP TECHNIQUE : APPLICATION TOWARDS THE CONSTRUCTION OF A VISUALIZATION SKILLS MODEL TECHNICAL COMMUNICATION GRAPHICS SUBJECT

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**Abstract**
*This article discusses the Nominal Group Technique (NGT) as an alternative strategy for developing lists of fun elements to model visualization skills. This method offers a structured approach to improve teachers' teaching and learning strategies to improve visualization skills. This research used NGT to systematically obtain and validate elements of enjoyment for inclusion in the model, involving a panel of experts who participated in a series of rounds to refine and prioritize elements based on their relevance and importance. Initially, 35 fun elements were identified through an extensive literature review. These were then presented to experts during NGT sessions, where they discussed, ranked and voted, leading to the selection of 28 key elements for model development. The findings show that the NGT technique facilitates efficient and effective validation of these elements, ensuring that they are robustly developed through expert consensus. Furthermore, the application of NGT in this research highlights its potential as a valuable addition to the diversity of research methods in Malaysia, especially in the field of education.*

*Keywords: Nominal Group Technique (NGT), Model, Fun Element.*

## INTRODUCTION

Visualization skills are an important element in technical education, especially in the subject of Technical Communication Graphics. These skills allow students to understand and interpret information in visual forms such as diagrams, graphs, and technical drawings. In addition, visualization skills play an important role in Technical and Vocational Education and Training (TVET) by providing students with the ability to interpret and create technical drawings and visualizations that are critical in various technical fields such as engineering and architecture (Khan, 2024). Visualization skills are an important aspect of TVET education because they allow students to better understand technical concepts through visual depiction. Visualizations help students to understand complex concepts and strengthen their understanding of the technical topics being taught.

A study by Aldossari (2020) shows that visualization can also help in reducing stigma towards vocational and technical training among students. By using accurate visualization, TVET can show students the potential and opportunities available in technical fields, as well as provide a deeper understanding of the importance and relevance of technical skills in the job market. Therefore, visualization skills in TVET not only help students to understand technical concepts better, but also play a role in reducing the stigma towards vocational and technical training and help students see the real value in acquiring the technical skills needed in the job market.

The mastery of visualization skills is a critical competency in Technical and Vocational Education and Training (TVET) that directly impacts students' ability to understand and apply technical concepts effectively. However, there is growing concern in Malaysia, as well as globally, regarding the inadequate level of visualization skills among students at both secondary and higher education levels. This deficiency poses significant challenges in the teaching and learning process, potentially hindering students' overall academic and professional development in technical fields.

Several studies have highlighted the severity of this issue within the Malaysian educational context. Research conducted by Marji et al. (2019) and Ali et al. (2022) revealed that secondary school students in Malaysia exhibit a weak level of visualization ability, which suggests that current educational practices may not be sufficiently addressing the development of these essential skills. This problem is not confined to the secondary level; it extends into higher education as well. Studies by Dayana Farzeeha and Mahani (2014), Marwa et al. (2020), and Sawant et al. (2023) further emphasize that students in higher education institutions also demonstrate only a moderate level of visualization ability, indicating a persistent gap in skill acquisition that could affect their readiness for the workforce.

The persistence of this issue across different educational levels points to a systemic challenge within the TVET system in Malaysia. The inability to effectively develop students' visualization skills may undermine the goals of TVET programs, which aim to equip students with practical and technical competencies necessary for success in various industries. Addressing this gap is therefore crucial, not only for enhancing students' academic performance but also for ensuring that they are well-prepared to meet the demands of the modern workforce. This research aims to tackle this issue by exploring alternative strategies, such as the Nominal Group Technique (NGT), to develop a robust visualization skill model that can improve teaching and learning practices in the TVET context.

In 2018, the assessment format for Paper 1 Technical Communication Graphics for the Malaysian Certificate Examination issued by the Technical and Vocational Examination Construction Sector (KPM Examination Board, 2017) clearly shows that the total marks for the theory section are 30 marks and 70 marks for the drawing section. Directly, students not only need to master drawing techniques but also need to master TCG theory. Based on the findings of the study (Tee et al., 2023), the level of visualization ability of TCG students in Malaysia is at a low level. This situation is worsened by students having to memorize theories related to TCG. According to Hoque (2018), the biggest learning weakness among students is that they have to memorize learning material at school.

In addition, the challenges and issues faced by Malaysia in reforming TVET for the world of work have been highlighted, emphasizing the importance of addressing spatial visualization skills in the evolving vocational education landscape (Salleh, 2020). Furthermore, the need to bridge the skills gap to meet the demands of technical collaboration, vocational education and school-workplace training in the 21st century underscores the importance of spatial visualization skills in aligning TVET with evolving workforce and industry needs (Oviawe., 2017) .

To improve these skills, various teaching approaches and methods have been proposed. One of the main challenges is when students face difficulties in translating three-dimensional objects into two-dimensional representations and vice versa. In

addition, traditional teaching methods may not be sufficient to meet the diverse learning needs of students, which causes variations in the acquisition of skills and competencies (Zhang & Zhao, 2023). Therefore, there is an urgent need for innovative approaches in improving the teaching and learning of visualization skills in Technical Communication Graphics (Alahira, 2024).

Innovative approaches in teaching visualization skills can bring significant benefits. For example, the use of multimedia technology in a curriculum based on multimedia technology has proven to be effective in improving visual understanding and communication. The teaching of visualization skills can also be improved through an emphasis on the use of digital technology. Studies show that teaching visual communication design based on digital technology can help in maximizing the dissemination of information through students' cognitive experiences (Bian & Ji, 2021). In addition, innovative approaches such as Visual Explorer™ rooted in years of research and practice can also help overcome challenges in teaching visualization skills (Manning & Tobias, 2022).

In the context of teaching visualization skills, it is important to take into account the diversity of students' needs and use appropriate approaches to improve their skills. By combining elements of innovative fun, technology, and art, the teaching of visualization skills in Technical Communication Graphics can be enhanced to meet the challenges faced in the learning process. Therefore, this study uses NGT to get views from education experts and instructors in the field of Technical Communication Graphics related to the elements of fun required to design a model of visualization skills for the subject of Technical Communication Graphics.

The application of the Nominal Group Technique (NGT) to the development of visualization skill models in Technical Communication Graphics offers several advantages. It allows experts to bring together multiple perspectives on the essential skills required and create a comprehensive model that addresses diverse teaching and learning needs. By involving expert views in the process, NGT ensures that the model produced is practical and effective. Previous studies have shown the effectiveness of NGT in the same context, highlighting its potential to improve educational outcomes in technical subjects (Pryor et al., 2015; Keßler et al., 2017; Aulinger et al., 2016). The results of this research have the potential to offer expert insight into the importance element of fun to improve visualization skills in Technical Communication Graphics subjects, then this study proposes the following questions:

> RQ1: Based on expert opinion, what elements should be included indevelop a model of Visualization Skills based on fun elements for TCG subjects?
>
> RQ2: Based on expert opinion, what is the priority position of model elements Visualization skills based on fun elements for TCG subjects?

## METHODOLOGY

### Nominal Group Technique (NGT)

The Nominal Group Technique (NGT) is a structured method for group brainstorming and prioritization of ideas that encourages contributions from all participants. Developed in the 1970s, NGTs have been widely used in various fields such as education, healthcare and business to leverage collective perspectives and make joint decisions. This technique involves generating ideas individually, discussing them as a group, and then organizing them to identify the most important or relevant concepts (Hutchings et al., 2013). NGT provides a systematic approach to collect and organize group thinking on specific questions, facilitating the process of consensus building and effective decision making (Roeden et al., 2011).

**Development**

NGT has developed and has been used by many researchers as a tool to achieve a purpose in the world of research. Many researchers have modified and adapted the NGT process to the studies conducted. However, the basic principle that is the backbone of the NGT process remains maintained where there are two main stages (1) problem identification through discussion; (2) vote to get a quick decision. In addition, Harvey and Holmes (2012) described that NGT requires the direct involvement of participants that is face-to-face or a workshop where participants are given an equal opportunity to speak and all questions to the questions raised also have the same validity. In other words, it is an opinion to reach an agreement in making a decision. Next, to get ideas for the questions that arise, it happens in silence, without any discussion with other participants or asking for clarification from the researcher. This is to allow participants to produce their own thoughts and ideas without interference or pressure from others, reducing dependence on other members who may not like to help and may affect the entire process (McMurray, 1994).

**Sample Study**

There are many views on the appropriate sample size in the use of this NGT method. However, most suggest a sample size that is not too large to reach hundreds of participants. According to Lomax and McLeman (1984), if NGT is conducted on a large group, it can be broken into small groups so that communication can be done more effectively. This is important so that the goals of the study can be achieved more effectively. Table 1 below displays the sample size suggested by previous researchers.

| Researcher | Sample size |
|---|---|
| Ven & Delbeco (1971) | 5-9 participants |
| Dang (2005) | 6 participants |
| Steward (2001) | 5-8 participants |
| Habibah et al. (2016) | 7-14participants |

Table 1. Previous Study Sample Size

With small sampling numbers, the selection of participants/samples is very important. According to Abdullah and Islam (2011), participants involved in the NGT method must be knowledgeable and experts in the field represented. This method is important so that the participants are able to share their views more carefully and in-depth and then produce the best results in the issues discussed.

For this study, the researcher has selected a total of seven participants consisting of one IPTA lecturer, one IPG lecturer, 3 SISC+ TVET and 2 Technical Communication Graphics specialist teachers. This selection was made based on their extensive experience and their direct involvement in the research topic. This study is in line with the study of Siti Farhah and Saedah (2015) in determining expert criteria for group discussions. It is recommended that an expert is a person who; (i) Extensive knowledge in the field studied; (ii) Professionals and have experience working within the scope of the study; (iii) Willing to participate voluntarily based on availability and time suitability; (iv) Have more than five years of experience. The list of experts involved can be referred to in Table 2.

| No. | Academic qualifications | Expertise | Work experience |
|---|---|---|---|
| E1. | Doctor of Philosophy | - TVET expert<br>- Deputy Dean (Development Students and Alumni) IPTA | 20 Years |
| E2. | Doctor of Philosophy | - TVET expert<br>- IPG Senior Academic Lecturer | 32 Years |
| E3. | Masters | - TVET expert<br>- TCG Master Trainer<br>- Head of TVET Unit | 32 Years |
| E4. | Masters | - TVET expert<br>- SiSC+ TVET | 18 Years |
| E5. | Bachelor | - TVET expert<br>- SiSC+ TVET | 32 Years |
| E6. | Bachelor | - TCG Expert Teacher<br>- TCG SPM Paper Examiner | 20 Years |
| E7. | Bachelor | - TCG Assessment Teacher<br>- TCG SPM Paper Examiner | 14 Years |

Table 2 . List of Experts Involved

**NGT Workshop Preparation**

The selection of the venue for the NGT session is important so that the generation of quality ideas can be produced. Make sure the chosen place is comfortable and conducive. The table is arranged in a 'U' shape to facilitate discussion. Participants are also provided with workshop equipment such as pencils, pens, paper, related notes and some equipment that is deemed necessary.

**NGT Process**

For this study, the selected experts were brought together in a workshop to facilitate the study. The workshop is conducted by a moderator to facilitate the communication process. The NGT process that has been carried out begins with the researcher initially listing a list of fun elements that are suitable to be carried out to improve visualization skills in the subject of Technical Communication Graphics. The list of elements of this activity is the result of a literature review and discussion from experts. This initial list is necessary as a guide to start the workshop session. This allows the discussion time to be shortened. Nevertheless, experts can respond whether they agree or disagree with the initial list of activity elements presented. Only those activities that reach mutual agreement are included in the developed model. Experts are also allowed to express additional ideas that they think are necessary for the model. There are several basic steps in conducting NGT as shown in Table 3:

| Phase | Activities |
|---|---|
| Phase 1 | Moderator gives a general explanation about the study being done<br>• Next is a description of the list of elements that have been formed in the analysis design elements of the model. (the list is given earlier to make it easier review process)<br>• Time allotted: 15 minutes |
| Phase 2 | The idea generation process by study participants<br>• With the help of stationery provided, participants write ideas based on knowledge and experience in their respective fields.<br>• Time allotted 10 – 15 minutes |
| Phase 3 | Sharing of ideas between study participants<br>• Ideas are presented and discussed with the participants. |
| Phase 4 | Discussion of items, themes and elements for the issue being studied<br>• Participants explain and discuss unclear ideas or elements so that all elements can be understood.<br>• These elements are categorized, improved, and themed. |
| Phase 5 | Study participant voting process<br>• Based on the list of fun elements developed, a questionnaire distributed to participants for the voting process.<br>• Participants can give 7 points for the most important element, 6 points for important elements and so on.<br>• The moderator collects the questionnaire for analysis purposes. |

Table 3. NGT Process

**Prefix Construction of Fun Elements**

At the initial stage, the process involved in this section is literature reading, expert interviews aimed at element verification. A total of 3 experts have been selected for the purpose of obtaining accurate views and recommendations regarding the model to be developed. These experts have a wide field in the field of education where they are directly involved in the teaching and learning curriculum of Technical Communication Graphics subjects. At this stage as well, these three experts have been presented with the elements that have been obtained as a result of reading the literature. In the context of this study, the formation of the elements required for the construction of the proposed model is as in Table 4.

| No. | Fun Elements |
|---|---|
| 1 | Improve understanding and memory |
| 2 | Modeling and Simulation |
| 3 | Use of Interactive Board (Smartboard) |
| 4 | Improved Conceptual Understanding |
| 5 | Visual Adaptation Based on Context |
| 6 | Acknowledgment and Praise |
| 7 | Integration of Art in Learning |
| 8 | Imaging and Concept Mapping Activities |
| 9 | Interesting and fun interactions |
| 10 | DIY Learning Aids (Do-It-Yourself) |
| 11 | Application of theoretical concepts into practical |
| 12 | Visualization Tools Like Visualizer |
| 13 | Effective Communication |
| 14 | Immersive Learning Experience |
| 15 | Presentation of complex information |

| | |
|---|---|
| 16 | Interesting learning experience |
| 17 | Collaborative Learning |
| 18 | Project Based Learning |
| 19 | Educational Tablets and Applications |
| 20 | Context-based education |
| 21 | Sense of Accomplishment |
| 22 | Critical Thinking and Analytics |
| 23 | Development of Spatial Skills |
| 24 | Puzzles and 3D Models |
| 25 | Translating thoughts into visuals |
| 26 | Use of Visual Media |
| 27 | Design and Innovation |
| 28 | Clear goals and objectives |
| 29 | Increased Attention and Concentration |
| 30 | Simplification and organization of ideas |
| 31 | Hands-On Learning |
| 32 | Feedback and Collaboration |
| 33 | Complex problem solving |
| 34 | Effective Use of Visual Tools |
| 35 | Games and Simulations |

Table 4. Preliminary List of Fun Elements of the Visualization Skills Model

The results of this initial finding will be used as a basis for an expert panel in evaluating and validating this element in the NGT workshop before it is used as content in the model.

**RESULTS**

At this stage, the findings in Table 5 are used to be presented to a group of 7 experts at the NGT session with the aim of obtaining views, clarifying ideas, sentence structure and making a decision whether to maintain or reject ideas that are not relevant to the context of the study. At the end of the meeting of the NGT session, a consensus was reached by the expert group where the experts agreed to accept 28 activity elements from the 35 activity elements that had been proposed at the initial stage. These selected elements have been verified and the sentence structure has been improved by a group of experts. The experts were also given a set of questionnaires for the validity and reliability of data in the production of a visualization skill model based on fun elements in the subject of Technical Communication Graphics. This voting also aims to accept and reject the elements that have been proposed as a result of the discussions that have been debated in this group. Table 6 shows the results obtained for the construction of the Visualization Skills model based on fun elements along with the score, percentage and also the priority of the voting results to obtain expert consensus regarding the elements that have been presented. The scale used for the purpose of this voting is a scale from 1 to 7, that is, scale 1 = Strongly Disagree; 2 = Strongly Disagree, 3 = Disagree; 4 = Less agree; 5 = agree; 6 = Strongly Agree; 7 = Strongly Agree.

| No. | Fun Elements |
|---|---|
| 1 | Improve understanding and memory |
| 2 | Modeling and Simulation |
| 3 | Use of Interactive Board (Smartboard) |
| 4 | Improved Conceptual Understanding |
| 5 | Visual Adaptation Based on Context |
| 6 | Acknowledgment and Praise |
| 7 | Imaging and Concept Mapping Activities |
| 8 | Interesting and fun interactions |
| 9 | Application of theoretical concepts into practical |
| 10 | Visualization Tools Like Visualizer |
| 11 | Effective Communication |
| 12 | Presentation of complex information |

| | |
|---|---|
| 13 | An interesting learning experience |
| 14 | Project Based Learning |
| 15 | Educational Tablets and Applications |
| 16 | Context-based education |
| 17 | Sense of Accomplishment |
| 18 | Development of Spatial Skills |
| 19 | Puzzles and 3D Models |
| 20 | Translating thoughts into visuals |
| 21 | Use of Visual Media |
| 22 | Design and Innovation |
| 23 | Clear goals and objectives |
| 24 | Simplification and organization of ideas |
| 25 | Hands-On Learning |
| 26 | Complex problem solving |
| 27 | Effective Use of Visual Tools |
| 28 | Games and Simulations |

Table 5. List of Improved Fun Elements

*** E = Expert**
*** Acceptance Percentage ≥ 70%**

| No. | Fun Element | E1 | E2 | E3 | E4 | E5 | E6 | E7 | Score | Percentage (%) | Rank | Assestment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Use of Interactive Board (Smartboard) | 6 | 7 | 7 | 6 | 6 | 7 | 7 | 46 | 94 | **1** | **Accepted** |
| 2 | Design and Innovation | 6 | 7 | 6 | 7 | 7 | 6 | 7 | 46 | 94 | **1** | **Accepted** |
| 3 | Educational Tablets and Applications | 6 | 7 | 6 | 6 | 6 | 6 | 7 | 44 | 90 | **2** | **Accepted** |
| 4 | Interesting learning experience | 6 | 7 | 6 | 6 | 6 | 7 | 6 | 44 | 90 | **2** | **Accepted** |
| 5 | Visual Adaptation Based on Context | 7 | 6 | 6 | 7 | 6 | 6 | 6 | 44 | 90 | **2** | **Accepted** |
| 6 | Use of Visual Media | 6 | 6 | 5 | 6 | 6 | 7 | 7 | 43 | 88 | **3** | **Accepted** |
| 7 | Hands-On Learning | 6 | 7 | 6 | 6 | 5 | 7 | 6 | 43 | 88 | **3** | **Accepted** |
| 8 | Improve understanding and memory | 7 | 6 | 5 | 6 | 6 | 6 | 7 | 43 | 88 | **3** | **Accepted** |
| 9 | Interesting and fun interactions | 6 | 6 | 7 | 6 | 6 | 5 | 7 | 43 | 88 | **3** | **Accepted** |
| 10 | Acknowledgment and Praise | 6 | 7 | 7 | 6 | 6 | 6 | 5 | 43 | 88 | **3** | **Accepted** |
| 11 | Sense of Accomplishment | 5 | 7 | 6 | 6 | 6 | 7 | 6 | 43 | 88 | **3** | **Accepted** |
| 12 | Simplification and organization of ideas | 6 | 7 | 7 | 6 | 5 | 6 | 6 | 43 | 88 | **3** | **Accepted** |
| 13 | Visualization Tools Like Visualizer | 6 | 6 | 5 | 7 | 6 | 6 | 6 | 42 | 86 | **4** | **Accepted** |
| 14 | Effective Use of Visual Tools | 5 | 6 | 6 | 7 | 5 | 6 | 7 | 42 | 86 | **4** | **Accepted** |
| 15 | Games and Simulations | 5 | 5 | 7 | 5 | 7 | 6 | 6 | 41 | 84 | **5** | **Accepted** |
| 16 | Imaging and Concept Mapping Activities | 7 | 4 | 7 | 4 | 7 | 6 | 6 | 41 | 84 | **5** | **Accepted** |
| 17 | Context-based education | 5 | 6 | 7 | 5 | 6 | 6 | 6 | 41 | 84 | **5** | **Accepted** |
| 18 | Clear goals and objectives | 6 | 5 | 6 | 6 | 6 | 6 | 6 | 41 | 84 | **5** | **Accepted** |
| 19 | Application of theoretical concepts into practice | 6 | 6 | 5 | 6 | 5 | 7 | 6 | 41 | 84 | **5** | **Accepted** |
| 20 | Complex problem solving | 5 | 5 | 7 | 5 | 6 | 6 | 7 | 41 | 84 | **5** | **Accepted** |
| 21 | Modeling and Simulation | 5 | 6 | 6 | 7 | 6 | 5 | 6 | 41 | 84 | **5** | **Accepted** |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | Development of Spatial Skills | 6 | 6 | 6 | 5 | 6 | 6 | 6 | 41 | 84 | **5** | **Accepted** |
| 23 | Presentation of complex information | 6 | 5 | 6 | 7 | 6 | 6 | 5 | 41 | 84 | **5** | **Accepted** |
| 24 | Puzzles and 3D Models | 6 | 6 | 6 | 5 | 6 | 6 | 5 | 40 | 82 | **6** | **Accepted** |
| 25 | Effective Communication | 6 | 6 | 5 | 6 | 5 | 7 | 5 | 40 | 82 | **6** | **Accepted** |
| 26 | Translating thoughts into visuals | 6 | 6 | 7 | 5 | 6 | 5 | 5 | 40 | 82 | **6** | **Accepted** |
| 27 | ImprovedConceptual Understanding | 6 | 5 | 6 | 5 | 4 | 6 | 7 | 39 | 80 | **7** | **Accepted** |
| 28 | Project Based Learning | 5 | 5 | 6 | 6 | 5 | 5 | 5 | 37 | 76 | **8** | **Accepted** |

Table 6. Group Technique Nominal Data Findings, element priority position of Visualization Skill Model based on elements fun in Technical Communication Graphics subjects in secondary school

**DISCUSION**

As a result of the voting done and the findings obtained based on Table 6, the following is a list of fun elements according to the priority position that has been agreed upon and accepted by the expert group selected to be used in developing the model. Analyze the findings for this purpose using a 7-point measurement scale. Based on the analysis of the results of this vote, the final list of elements was arranged according to the priority ranking as listed. This priority position is very important because it is one of the procedures that must be carried out before being included in the concept star software. The final list of elements and the priority ranking of fun elements below have answered both research questions, which are based on expert views, what is the main list of fun elements and the priority ranking of the elements of the Visualization Skills model based on fun elements for the subject of Technical Communication Graphics in high school.

At the ISM session conducted, fun elements will be included in the concept star software based on a list of priorities that have been agreed upon. Based on the list that has been formed, the element of using an interactive board (Smartboard) is the element that is in the top position. This is in line with the report of Muhamad Ridhuan Tony (2014) where the element of activity that is in the top position must be paired with the element of activity that is on the next priority list which is the ranking that is below. In an ISM session, each activity element will be paired with other elements throughout the ISM session.

To improve visualization skills, incorporating fun elements into educational activities has been shown to be beneficial. Fun elements can engage students, making the learning environment more enjoyable and effective. For instance, research has indicated that animations, educational games, and interactive training methods can improve students' visualization skills (Mnguni & Moyo, 2021; Yaacob et al., 2021; Yıldız, 2021). These methods not only enhance understanding but also promote problem-solving abilities, which are essential for skill development. Moreover, the use of computer simulations and 3D technology has been suggested to be effective in enhancing spatial visualization skills (Mjenda, 2023; Park et al., 2010). Furthermore, fun elements in learning environments cater to different learning styles, making education more inclusive and engaging for students with varying preferences (Yıldız, 2021). By incorporating elements such as curiosity, adventure, imagination, and challenge, students are more likely to be motivated and actively participate in the learning process.

Additionally, the use of visual aids, graphic design tools, and technology can significantly improve students' proficiency in understanding and applying concepts in a visual context (Banate, 2024). Incorporating fun elements into educational settings not only enhances visualization skills but also contributes to overall skill development. By creating a dynamic and engaging learning atmosphere, teachers can motivate students, improve their problem-solving abilities, and foster a deeper understanding of concepts (Marhun, 2020). Therefore, integrating fun elements into educational practices can be a

valuable strategy for enhancing visualization skills and promoting effective learning outcomes.

This study employed the Nominal Group Technique (NGT) to prioritize and validate a list of fun elements that could enhance visualization skills within the Technical Communication Graphics (TCG) curriculum, a key component of Technical and Vocational Education and Training (TVET). The expert group identified and ranked these elements through a structured voting process, with the final list being critical for integration into educational tools such as the *Concept Star* software.

The analysis revealed that the use of an interactive board (Smartboard) was the top-ranked fun element, consistent with previous findings that emphasize the importance of pairing high-priority activities with others to maximize engagement and learning outcomes. This aligns with broader research suggesting that fun elements such as animations, educational games, and 3D technology are effective in improving students' visualization skills by making the learning environment more engaging and inclusive.

## CONCLUSION

Incorporating fun elements into educational activities can improve students' visualization skills and create an engaging learning experience. Research shows that using animation, educational games, interactive training methods, computer simulations and 3D technology can improve spatial visualization and problem-solving abilities. This engaging method caters to a variety of learning styles, making education more inclusive and motivating students to actively participate. Visual aids and graphic design tools help in understanding and using visual concepts. By creating a dynamic and fun learning environment, educators can foster deeper understanding and skill development, ultimately leading to more effective educational outcomes.

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