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Can Digital Drawing Tools Significantly Develop Children's Artistic Ability and Creative Activity?

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ABSTRACT:
This study aims to investigate how the new digital art tools can significantly improve children's artistic ability and creative activity. This particular research tested 16 students aged 9-10 years old in art classes, with the intention of presenting a model for the development and measurement of technological creativity. It uses a modified TAM technology acceptance model to assess the usefulness of digital art tools. The children were provided with appropriate subjects and techniques to improve their performance with the tools, and the relationship between art, technology and creativity was explored. The results of the project show a general improvement in pupils' artistic ability and inventiveness through the development of their technological skills, as well as greater ability to express themselves visually.

KEYWORDS: *Artistic ability, creative activity, children, ease of use of digital art tools, TAM technology acceptance model, usefulness of digital art tools, visual art*

I. INTRODUCTION

Many new digital methods of drawing using computers and software have become available recently. These techniques are now even available in primary schools. They include laptops, iPads, tablets, smart boards and special software such as Photoshop, 3D, Premier Illustrator and others. This hasexpanded the boundaries of traditional drawing and made it possible and much easier to re-arrange, select, add, delete, add colours, store and transmit work, since these digital tools are now part of modern technology. Children are encouraged to use them and this is a way to both improve children's cognitive skills and enhance their creativity. However, some researchers argue that such technology destroys artistic creativity because it puts mechanical processes between the artist and the finished work of art. This is related to concerns about the use of 'instant art' [1]and the attraction of easy reproduction by using programs such as those mentioned above. It is feared that exposure to so many electronic images might have a negative impact on pupils' imaginations. It is also claimed that technology produces an over-sanitized result: for example, the Disney studios [2] decided this may be the case, and returned to traditional methods. In contrast, Davis [3] demonstrates that digital tools are a good method of building artistic creativity, as well as being easier to use in circumstances where great flexibility is needed in terms of source materials and techniques. A number of studies have found that digital tools can offer the user more choice and variety than traditional methods, as"Students can manipulate drawing tools with ease, and can perform subsequent revision and dynamic linkage of ideas and concepts" [4].

In order to answer the questionposed in the title, regarding whether digital tools can help to develop children's artistic ability, further information is needed. Much research has been focusedon the use of technology in schools, and the subject of children's artistic abilities has been extensively discussed, but there is little published information on the topic of art combined with technology and virtually none on this topic in relation to children of 7-11 years old. Until recently, the use of computers in schools was primarily focused on older students, but as the equipmenthas become less expensive,its use has spread to all schools. Now computer technology is readily available for educational purposes in many parts of the world. In addition, with the spread of home computers, children of a younger age generally have some experience of using them.
Many world-famous artists are experimenting with the new technological capabilities that are currently available. Artistic creativity and development is becoming increasingly important in the modern world, where visual information is essential.When trying to collect data for the present research,

it was found to be impossible to carry out a large-scale survey of junior school art practice.Even though computers are present in all English schools, there is no information available to say which schools, or how many, are practising the use of digital tools in art classes. Information was needed on certain main topics, which canbe expressed most simply as a series of questions. Do digital tools help children to express themselves visually? Do they promote and develop artistic ability?Do children find the digital tools satisfactory to use?How easy or difficult are they to use?Does ease of use affect the children's usage and motivation,and thus their ability?Which digital tools are best and why?Due to limitations regarding time and space, the research was restrictedto collecting data from schools only.

II. PREVIOUS RESEARCH

Opinions about the value of digital tools vary. Some studies find that the use of technology in art is positive as an aid to creativity, whereas others find it has a negative effect. This question is tested and researched in daily practice in the fields of commerce, education and fine art. One of the concerns raised is the risk of'spoon-feeding' [5].In addition, according to Papadimitriou [6], exposure to too many electronic images might prevent the pupil's own imaginations working. It is feared that 'Instant art' and the temptations of easy reproduction, such as those that Adobe Illustrator and Photoshop provide, can destroy creativity [1].However, there appears to be more favourable than unfavourable research opinion. As researcher [7] indicates, theeffective use of computers to express creativity also depends on how imaginative the user is. Faber [8] demonstrates that new technology can give a greater understanding of how we express the world through drawing, and this can strengthen the use of traditional tools. Gan [9] favours the use of technological tools to strengthen children's manipulative skills and help them to understand complex ideas. Other studies show how extremely useful digital drawing methods can be as teaching aids, for speed and clarity.

III. METHODOLOGY

It was decided that a case study would be the best choice of strategy for collecting information. This flexible approach allows mixed methods to be used effectively. Data has been collected from a sample of 16 students, in an art workshop using both digital and traditional drawing tools. The 16 students comprised 11 males and 5 females in a classroom art workshop. The agerange chosen was 9-10 year olds, and they were given traditional tools such as paper, pencils, erasers and colours to use first. The aim of the testwas to show how students can be equally creative using digital and traditional drawing tools. Tamazight fonts were used as an art designand the intention was to teach the students to use this font in avisual way. They were asked to draw Tamazight fonts on different themes using traditional drawing tools, and then to draw and paint the same ideas using digital tools. The students worked as individuals and as groups. The traditional Tamazight font drawings were incorporated into the computer via utilisation of the art software known as 'Tux Paint'.

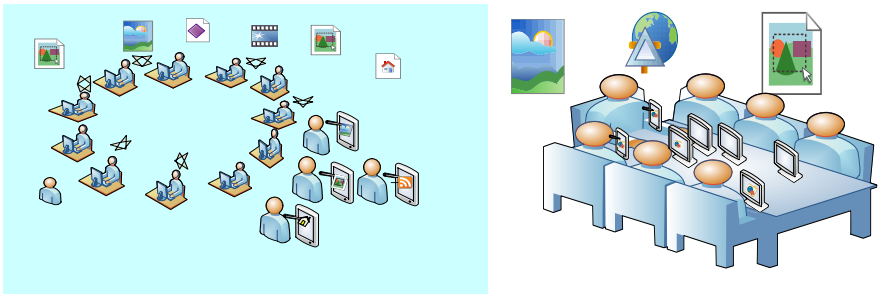

Fig 1. Graphic illustrating children working both independently and in a group

The art tools available in the ICT room were'Tux paint'software and iPads; few pupils had access to Tablets and iPads at home, which may have affected their abilities. They startedby working with traditional tools and then pursued the use of digital tools.

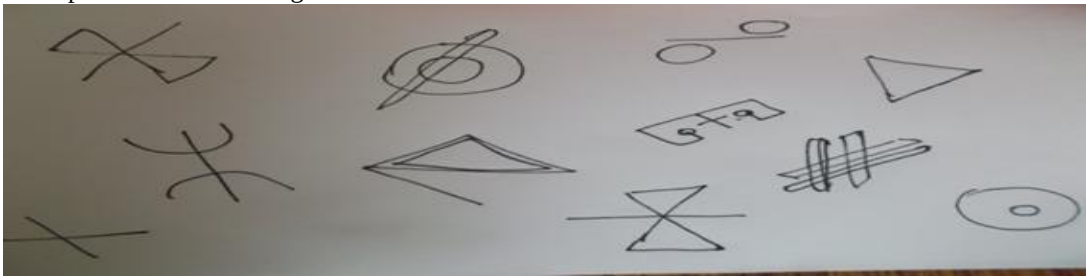

Fig 2. Picture illustrating Tamazight fonts

To answer the research questions, the data from the case study was analysed and placed into categories. Three techniques were used to collect information: narrative observation, semi-structured interview and a questionnaire.

2.1 Information obtained by observation and semi-structured interviews

The study concentrates on three topics: the enhancement of artistic creativity in using the fonts, the pupils 'motivation, and assessment of the digital tools and how well pupils use them. At first, the pupils drew with traditional methods to involve them in the project. They then drew the same things using digital software techniques. At the beginning, they had no knowledgeof these tools and no clear idea of what to do. However, there was good progressin their technical skills and artistic ability. By the end of the project, they were almost all using the tools correctly and completing their work using most of the software available. They showed continuity of ideas, a clear idea/message in their work and definite self-expression. Working as a group is also a powerful means of helping pupilsexplore possibilities and become more creative. The work involved the children in the whole design process. It was possible to observe how different tools motivated them to create more and better art work. Only two or three pupils were unable to continue or complete work, and had to find alternative ways to achieve their ideas, or even change their subject completely. Most pupils solved any difficulties and showed great persistence in doing so. Their motivation to overcome difficulties was very strong. There appeared to be a general improvement in artistic creativity in the class, shown by the usage of more complex ideas and better and increased use of shape, colour and space, as well as improved ability to complete projects. The semi-structured interview data was obtained using grounded theory to provide greater depth and accuracy. The three topics exploredwithin the information obtained fromsemi-structuredinterviews were againenhancement of artistic creativityin using the fonts, pupil's motivation, and assessment of the digital tools and how well pupils use them.

Pupil's motivation and assessment of digital tools and how well pupils use them: questions and researcher's analysis of answers

Table 1. Interview questions and analysis of answers

Question	*Answer*	*Observer'snotes*
Which tool was most useful to carry your project?	*All the students find that 'Magic' is the best tool because it makes good art; it gives more than they expect. The Magic tool has many different functions. It can give students the opportunity to create different forms of work. 6 of the 16 students also add 'Stamp'as a preferred tool. They say it gives good results for their art work, is more realistic and has big effects.One student says, "Magic makes big effects for my work". 3 students like the graphic tool as well.*	*Students explore the ease and usefulness of digital tools*
Which tool was easiest to use? Can you say why?	*All students find that the tools which are easy to use are not always the most useful. Some tools are difficult to use but useful, while some of them, such as brushes, are very useful but are difficult to use. In contrast, lines are difficult to use and are also not useful. One of the students says, "I switch on the software then I use the tools".*	*Ease of use in relation to usefulness*
How do you tell the computer you want to draw?	*Students start giving actual detail about how and which buttons are used to start their work. All of them start with basic tools first,such as pencil and rubber to draw the idea.*	*Here students know how to start working*
What if you make a mistake?	*Some of them say that it is easy to solve problems by using a rubber, or to cover mistakes by putting another picture over it or deleting the picture and doing it again. A student says, "I can go back two steps to delete the mistake". Another says "I will ask the teacher to help me to correct the mistake".*	*All of them know how to solve problems*
Do you think that you do better drawings using digital or has using them made	*About 13 of the 16 think drawing by using digital tools makes better art. The rest say they prefer to touch and feel with the tools to do creative art work. One student says, "I like to touch my art work and my tools, then I feel that is my creativity". That is, they prefer traditional tools.*	*Preference depends on the student's interest*

your work less good?		
What did you learn from doing your project?	*They say they have learned how to use the tools, developed skillsin using them and understand each tool's function, and know how to use the tools perfectly.*	*Understand each tool's function*
Do you know how to choose colours for project?	*All the students say, yes, they know how to choose colours, because they find it easy, useful and enjoyable to use.*	*Colours used tobuild artistic creativity*
My screen is full how do I make the space bigger?	*Some of the students find the digital screen too small. They like to draw on a big space such as smart board.*	*Space is important to develop their cognitive ability*
Did you find it more pleasant or easier to use the traditional and the digital tools?	*Some of the pupils support the digital method.A student says, "Digital tools have more effects". Another student prefers traditional methods: "It is easy and I can control the tools and it's very flexible". Another student says "Both tools have advantages and disadvantages and both are useful". The more you work, the more you build your talent with both types.*	*Both tools (D and T) haveadvantages and disadvantages*
In which subject do you like to use digital tools?	*Some students say, "We like some school topics. Drawing helps me to understand the topic more clearly, such as geography, history and others". Most say it is useful in all subjects.*	*Clear understanding*
What the advantages and disadvantages of digital and traditional tools?	*Some students say "Traditional tools make me closer to my project and are more feeling, sensitive and interesting. Both tools have advantages and disadvantages."Other students say that the digital tools add more than they expected. They can add things such as animation, sound and sound effects, as well as more colours. One student says, "Digital is a little bit strict, I can't control them, whereas traditional is easy to control".*	*T methods allow more feeling, sensitivity and interest*
Is there anything can make digital art work different and more attractive?	*Adding more pictures in the ICT room and providing more tables for drawing will offer more stimulation for art and creative activity.*	*The design of the place has a big impact for the child*

It appears from the interviews that in general, the children found the digital tools very useful. They are young children, however, and although it seems they appreciate the usefulness of these tools, at this stage of development they still find some difficulties in using them compared to simple traditional tools. On the other hand, their skill is improving all the time and clearly, thepupils enjoyed these sessions. Working as a group is also a powerful means of helping pupils investigate possibilities and become more creative. The children were involved in the work throughout the whole design process.

2.2Modification of the technology acceptance TAM model for the purposes of the current research

The Technology Acceptance Model (TAM) is an information systems theory that shows how users come to accept and use a technology [10].It appears that the basic TAM theory sometimes needs adjustment for different purposes. This would be necessary in the present research. The modified TAM model can help the teacher to assess the usefulness and ease of use of different digital art tools in producing creative art work with imagination and ability. Digital tools can be a support for children in their creative work. Evaluation of children's performance in a classroom project such as this enables a clear assessment of the children's capabilities, and can also determine which tools can motivate children to create a good piece of art.

This research has summarized the criticism of previous studies that TAM is too simple and does not explain the connections between intention and behaviour, or the pressures caused by having an ultimate goal. There can also be a danger of pre-determined action, or that PU and PEU are not sufficiently investigated. However, research also suggests that the TAM theory should work in more than one situation. Itcan be flexible and is able to adapt particularly well to children's personalities; thus, in an attempt to combine the social element with the technical element,it should be possible to assess both aspects using the Technology Acceptance Model.

Two of the most important factors affecting child learning and creativity are intrinsic, artistic motivation, which arises from within the person, and extrinsic motivation, which comes when a child is obliged to do something because of factors external to him or her, such as rewards like good grades, prizes and competitions. The child's attitude and motivation can be greatly affected by providing tools, by giving praise and by stimulation of ideas, for example, a drawing to complete, a pretend identity change or an imaginary situation. Possibly the main factor in building a child's artistic creativity is intrinsic motivation, because when children are motivated to do art work it either brings them pleasure, or they feel that what they are doing is significant.

The proposed framework for practical research

The modified TAM framework is based on input from the data collected from the case study. The exploration of results from the observation test, questionnaire and interviewswith pupils in the art classroom is also based on a literature review and diverse theories in the area of motivation and the effectiveness of digital art tools in developing children's artistic ability and promoting creative activity that could be used in the art classroom.

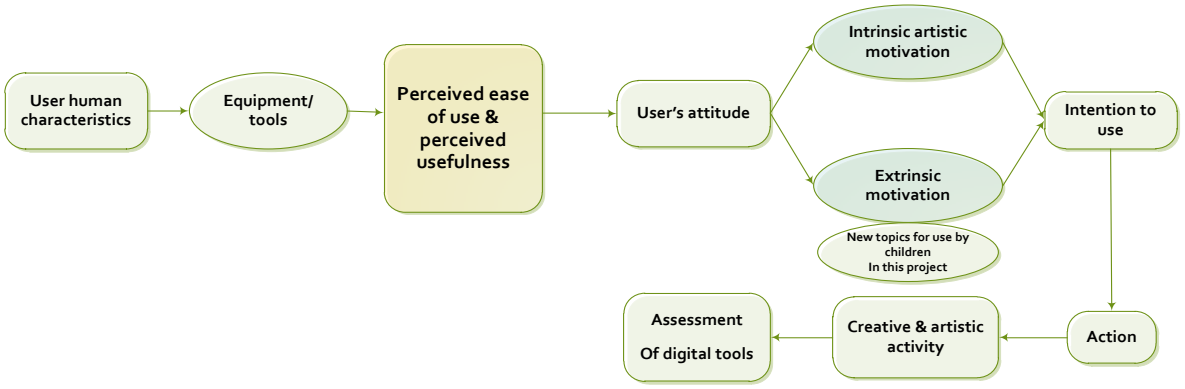

Fig4. Framework of modified TAM theory model for classroom project

Benefits of modified TAM theory for use in the present research:

- The present research suggests that the child's motivation and enjoyment are important,and the wish to create good artwork enhances the desire to use digital drawing tools perfectly and improve their performance. Thus, when a pupil understands how to use digital tools, and understands which are easy and which difficult to use, this leads to the child grasping the usefulness of digital tools.
- This new framework model helped to assess artistic ability and creativity to a limited extent. The results proved that ease of use is not important in developing artistic powers; satisfaction with the final product, whether its creation was easy or difficult, was far more important.
- This could be useful for both pupils and teachers as the use of digital tools in art increases within education at all levels.
- The new model of working enables the identification of relationships between art, technology and ability.
- The model must provide children with suitable tools and techniques to improve their performance by means of their attitudes, intentions and actions.

IV. CONCLUSIONS

Based on information from observation and interviews, the children (with one exception) felt that digital tools improved their creative ability. They were quite strongly motivated to use them by a wish to create art works, and also by the wish to improve their technological skills. There was also some understanding of the value of these tools in learning other subjects. It appears that the method of teaching art is important in promotingpupils'artistic ability and creative activity, and also in revealing students' talent. The teacher should encourage the students in order to stimulate and motivate them.

It seems that, in general, ease of use was not the main motivation when the children used digital tools. They found more ease and enjoyment, generally, when using traditional methods. The most popular digital methods were sometimes the easiest to use, but according to their own statements, it was not the ease of use, but the successful effects the tools provided which motivated the children to use them. It seems, therefore, that enjoyment and artistic satisfaction is more significantfor pupils than ease of use. Usefulness is more valuable than ease. The pupils all showed independence and initiative after an early lack of confidence. The researcher's opinion is that creative abilities and skills have been increased by the project. Surprisingly, although girls are traditionally regarded as less adventurous than boys, the girls showed more signs of acceptance of digital methods than the boys. The TAM method showed itself to be very useful in assessing the value of traditional and digital tools. It was also useful in documenting the children's progress in learning to use digital software, and it helped to assess the effect of the tools in motivating the children. In the researcher's opinion, the digital tools did improve the children's artistic expression and creativity.

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